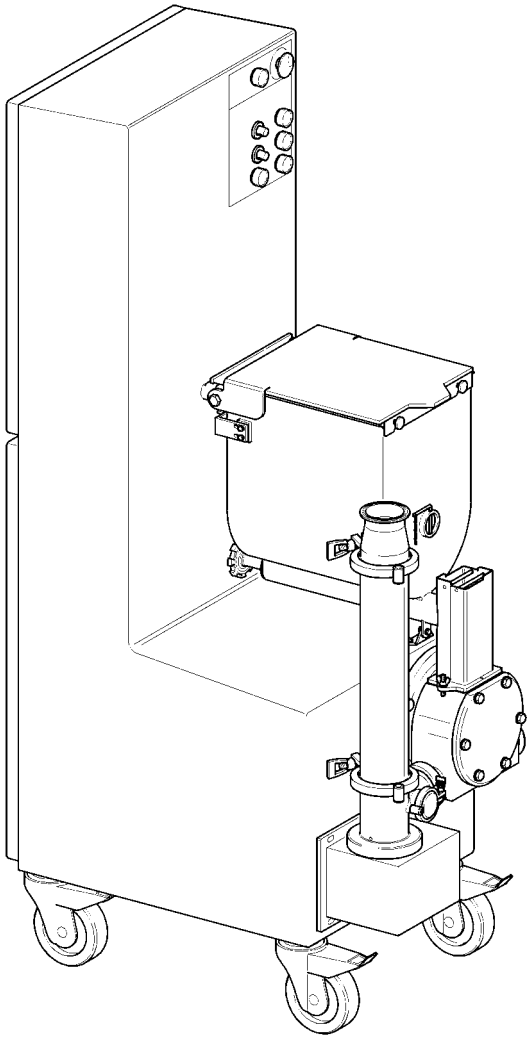
Gram Equipment

INSTRUCTION MANUAL
SPARE PARTS

IF 2000



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Gram Equipment

EU certificate of conformity

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Customer: **Charles Wait UK**

C & G
Order No: **G04/0854**

hereby certifies that:

Machine: **IF 2000**
mark

8.70.0034 **2004**
type, serial number, production year

conforms to the provisions of:

- Council Directive No. 73/23/EEC of 19th February 1973 with later alterations.
- Council Directive No. 89/336/EEC of 3rd May 1989 with later alterations.
- Council Directive of 14 June 1989 with later alterations on the approximation of the laws of the Member States relating to machinery (89/392/EEC) with special reference to Annex I on "Essential safety and health requirements relating to the design and construction of machinery".
- Council Directive No. 89/109/ECC of 25th January 1992.

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In conformity with this document the above-mentioned machine has been CE-marked.

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1. INTRODUCTION

1.1 SAFETY INSTRUCTIONS

WARNING: Do not operate or service your Gram Equipment equipment or machine before having read these safety rules.

1.1.1 USER'S RESPONSIBILITY

The basic rules of safety set forth in this secton are intended as a guide for the safe operation of Gram Equipment equipment or machines.
This general safety information, along with explicit service, maintenance and operational materials for each specific machine, make up the complete instruction manual.
All personnel, who will operate, service or be involved with this equipment in any way, should become totally familiar with this information prior to start-up.
It is the Buyer's responsibility to make certain that these procedures are followed and, should any major deviation or change in use from the original specifications be required, appropriate procedures should be established for the continued safe operation of the machine.
It is strongly recommended to contact Gram Equipment to make certain the machine can be converted to the new use in a reasonably safe manner.
If the machine is not purchased directly at Gram Equipment or its representative, it is the responsibility of the purchaser to ensure that the machine is according to the valid safety regulations.
It is strongly recommended that the purchaser contacts Gram Equipment to safeguard that the machine can be operated in a reasonably safe manner.

1.1.2 SAFETY FIRST

The equipment from Gram Equipment is designed and manufactured with due consideration and care for generally accepted safety standards.
However, the proper and safe performance of this equipment depends upon using sound and prudent operating, maintenance and servicing procedures under properly trained supervision. For your protection, and the protection of others, learn and always follow the safety rules outlined in this chapter.
Form safe working habits by reading the rules and abiding by them.
Keep this booklet handy and review it from time to time to refresh your understanding of the rules.

1.1.3 IMPORTANCE OF THE MANUAL

Personnel who work on the machine for production, cleaning, maintenance or repair, must be familiar with this manual either about instructions, or about risks and safety rules.
In particular operator must know the meaning of the safety labels placed on the machine.
For this reason the manual should be alweays available for the operators.
Personnel authorized to maintenance or repair must be informed about the existence of this manual and they must have a look at it before beginning operations.
Because the manual is subject to damages on account of use, we suggest to keep a copy in a safe and sheltered place. In any case is always possible to ask Gram Equipment for a new copy.

1.1.4 SAFETY SIGNS

The machine has some safety signs: see the related section for their meaning.
Operators must know the meaning of these several signs before beginning operations.
Signals must be checked every day for making sure that no one is damaged or came off, or illegible anyway.
In this case this adhesive tally has to be replaced with a new one.

1.1.5 OPERATIVE ZONE

An operating zone should be established around all machines.
A brightly painted guard rail or warning stripe can be used to define the zone.
The distance from machine surface to the limit from the operative zone should be at least 2 metres.
Only operators or other authorised personnel should be within the operating zone when machine control circuits are energised or the machine is running.
No tools or other equipment should be kept within the operating zone.

1.1.6 INSTALLATION

Power sources such as electric and air should be installed by trained and authorised personnel only.
Make sure a power disconnector on/off for the power sources is installed on the machine.
The disconnector must be of a type that can be locked in the power off position and the key must be removed.
Installation must comply with all applicable codes and standards, including those established by the Directorate of Labour Inspection of the country in question.

1.1.7 INSPECTIONS

Before starting the machine

- Be absolutely positive all guards and safety devices are installed and operative.
- Make certain that all personnel are clear of the machine.
- Remove from the operating zone any materials, tools or other foreign objects that could cause injury to personnel or damage the machine.
- Make certain that the machine is in operating condition.
- Make certain all indication lights, horns, pressure gauges or other safety devices or indicators are in working order.

In operation

- Do not operate this machine until you read and understand the operating instructions and become thoroughly familiar with the machine and its controls.
- Never operate a machine while a safety device or guard is removed or disconnected.
- Always wear any required safety/hygienic equipment, such as glasses, hats, shoes, ear protection or any required safety equipment.
- Do not start the machine until all other personnel in the area have been warned and have moved outside the operating zone.
- Remove any tools or other foreign objects from the operating zone before starting.
- Absolutely do not have loose clothing, neckties, necklaces or unrestrained long hair near an operating machine.
- Do not wear rings, watches, bracelets or other jewellery near an operating machine.
- Keep the operating zone free of obstacles that could cause a person to trip or fall towards an operating machine.
- Never sit or stand on anything that may cause you to fall against the machine.
- “Horseplay” around a machine at any time is dangerous and prohibited.
- Know the emergency stop procedure for the machine.
- Never operate the machine above specified speeds, pressures or temperatures.
- Keep alert and observe indicator lights and warnings that are displayed on the machine.
- Never leave the machine unattended while in operation.
- Do not operate faulty or damaged equipment. Make certain proper service and maintenance procedures have been performed.
- Avoid placing fingers, hands, or any parts of your body into the machine or near moving parts when control circuits are energised.

After Shut-down

- Make certain all air and electric power is turned off.

1.1.8 WORKING POSITIONS

In connection with the daily operation of the IF 2000, there are 2-3 working positions around the machine as illustrated by the below drawing.

Working Position 1

Here the operator is placed in front of the feed pump and the after mixer of the IF 2000, from where the dosage of ingredients is supervised.

From here new flavouring is filled into the hopper of the IF 2000.

Here the operator also is placed in front of the control panel of the IF 2000, from where the machine is controlled and adjusted.

On the control panel it is possible to adjust the actual operating data (Speeds for auger/shaker and feed pump).

The ON/OFF buttons and the emergency break are also placed on the control panel.

Working Position 2

From here new flavouring also can be filled into the hopper of the IF 2000 and is an alternative to working position 1.

Working Position 3

From here new flavouring also can be filled into the hopper of the IF 2000 and is an alternative to working position 1 and 2.

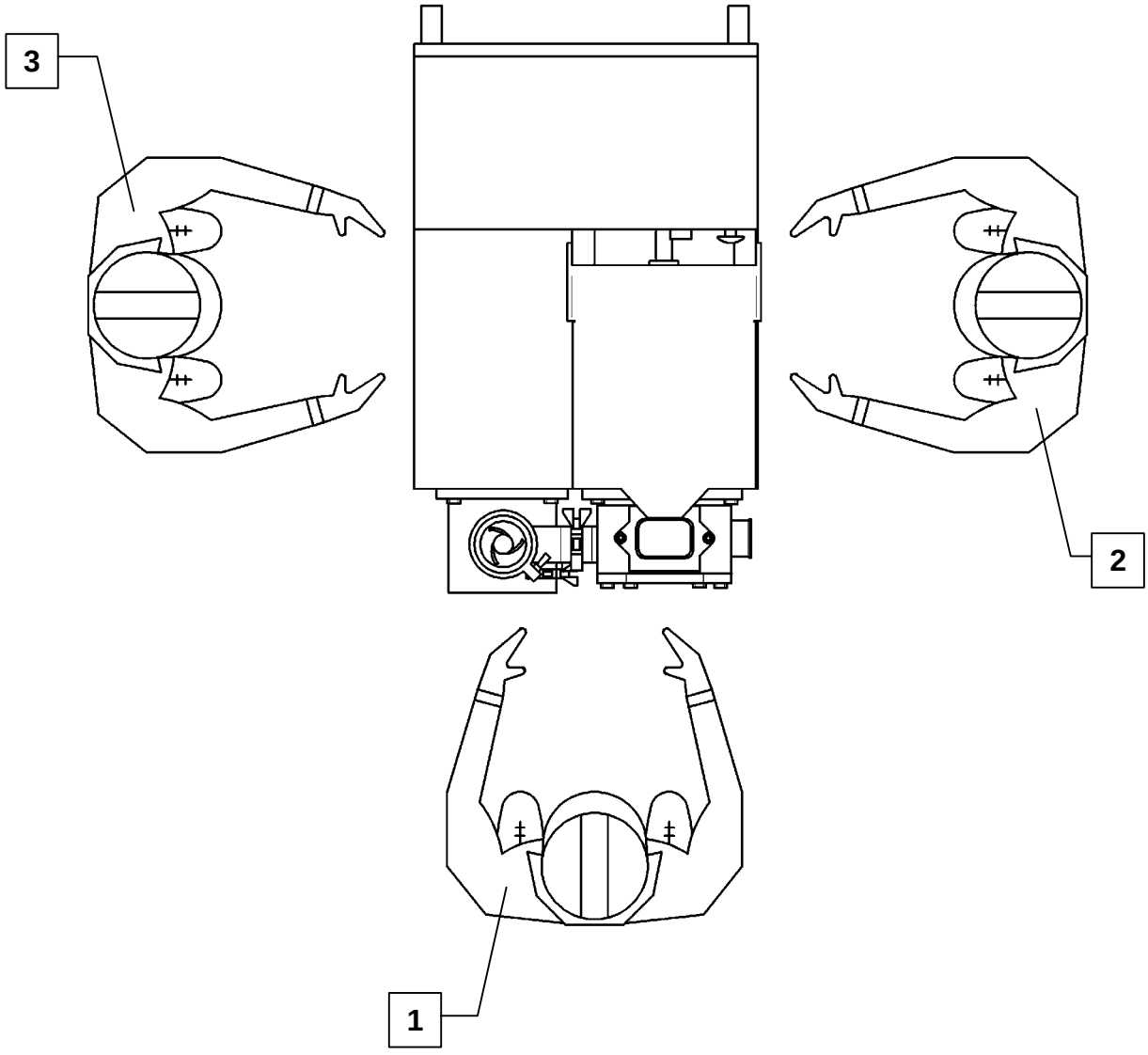


Fig. 1 – Working position

1.1.9 SERVICE AND MAINTENANCE

- Do not service a machine until you are thoroughly qualified and familiar with the tasks to be performed.
- Never operate any controls while other persons are performing maintenance on the machine.
- Do not by-pass a safety device.
- Always use the proper tool for the job.
- Never open covers that house electrical components when power is on.
- Only perform maintenance on a machine in motion when properly trained and required to do so. When directed to make adjustments on machines in motion, extreme care must be taken.
- All air and pressure must be relieved before performing maintenance or loosening connection on any pressurised system.
- Air and electrical power are to be turned off unless they are absolutely required for the specific servicing being performed.
- Replace fuses only when electrical power is off (locked out).
- Do not enter a confined space without first checking for toxic fumes and providing standby personnel on the site.

1.1.10 CLEANING

Manual cleaning procedures

- Do not use toxic and/or flammable solvents to clean a machine.
- Turn off air and electrical power (lock out) prior to cleaning a machine, unless otherwise specified in the equipment manual.
- Keep electrical panel covers closed when washing a machine.
- Always clean up spills around machine as soon as possible.
- Never attempt to clean a machine while it is operating.

Cleaning-in-place (C.I.P.) procedures

- Make certain that all connections in the cleaning circuit are tight to avoid contact with hot water or cleaning solutions.
- When the cleaning cycle is controlled from a remote or automated control centre, establish fail-safe procedures to avoid automatic start-up while servicing equipment in the circuit.
- On equipment which includes manways, make certain covers are closed, latched and nobody is left behind prior to starting the cleaning cycle.

1.1.11 ELECTRIC SYSTEM

- All electrical/electronic maintenance and service should be performed by trained and authorised electricians only.
- Always assume that power is on and treat all conditions as live. This practice assures a cautious approach which may prevent an accident or injury.
- To remove the load from circuit or equipment, open disconnecter or breaker and lock in open position.
- Make certain that the circuit is open by using the proper test equipment.
- **NOTE:** Test equipment must be checked at regular intervals.
- Capacitors must be given time to discharge, otherwise it should be done manually with care.
- There may be circumstances where “trouble-shooting” on live equipment may be required. Under such conditions, special precautions must be taken as follows:
- Make certain your tools and body are clear of the ground.
- Extra safety measures should be taken in damp areas.
- Be alert and avoid any outside distractions.
- Before applying power to any equipment, make certain that all personnel are clear of the machine.
- Control panel doors should be open only when checking out the electrical equipment or doing electrical connections.
- All electrical apparatus must be properly grounded and overload protected.
- All electrical connections should be protected by confining them within a sealed junction box.

WARNING: Do not disconnect the motors (pumps) connected to inverters before 10 min. have passed since machine shut down.

1.1.12 PERSONNEL FOR OPERATION

The operator who is going to operate the IF machine is to be trained by an authorized person as regards functioning of the machine and safety in connection with operating the machine.
Furthermore it must be secured that the operator has read and understood the contents of the instruction manual including the safety booklet "General Safety Instruction" of Gram Equipment.
The operator must be instructed in the meaning and placing of the safety signs.
The instruction manual will be frequently used and get worn in the course of time.
If the instruction manual should get so worn that it might result in misunderstandings or/and hazards, please order a new one from Gram Equipment.

PLEASE NOTE!
THE INSTRUCTION MANUAL FOR THE IF MACHINE, INCLUDING THE SAFETY INSTRUCTIONS, MUST AL-WAYS BE AVAILABLE TO THE OPERATORS.

1.1.13 FILLING THE HOPPER

When the machine is installed and ready for being put into production, the hopper is filled with the ingredient that is to be dosed into the ice cream. After filling the hopper, the different units on the machine can be started.
The hopper can hold <30 l of ingredients, depending on the density, this corresponds to between approx. 25 ÷ 35 kg.

PLEASE NOTE!
DURING OPERATION, THE SAFETY GRATE MUST ALWAYS BE MOUNTED AND SCREWED ON THE HOPPER, AS PROTECTION AGAINST THE AGITATOR AND AUGER.

Below illustration shows the IF 2000 from above, with the lid of the hopper opened.
If the machine is delivered with a mechanical after mixer, we recommend that the mixer must be started before ice cream is led through the pipe system of the IF 2000.
If the machine is operated with very stiff ice cream mix and the mixer is not rotating, there might be very high-pressure loss above the mixer.
In the worst case, the ice cream cannot be pressed through the mixer and the mixer will be blocked up.
The auger/shaker and feed pump are not to be started until the ingredient is ready to be added to the ice cream mix.
It is possible to led ice cream through the system of the IF 2000, even if the feed pump is not operating.
This secures a minimum waste of flavouring during start-up of the line, in which the IF 2000 is mounted.

For best performance, the speed of the feed pump always should be adjusted to the quantity of the ingredient – this means that the feed pump (the space between the scrapers) always should be filled up as much as possible, without overfilling it. This secures that a minimum of air is pumped into the ice cream.
When overfilling the feed pump, there is a risk of stocking up ingredients inside the inlet funnel.
In this case, reduce the speed of the pump and use the enclosed auxiliary tool for loosen the accumulated ingredients until it falls into the feed pump.

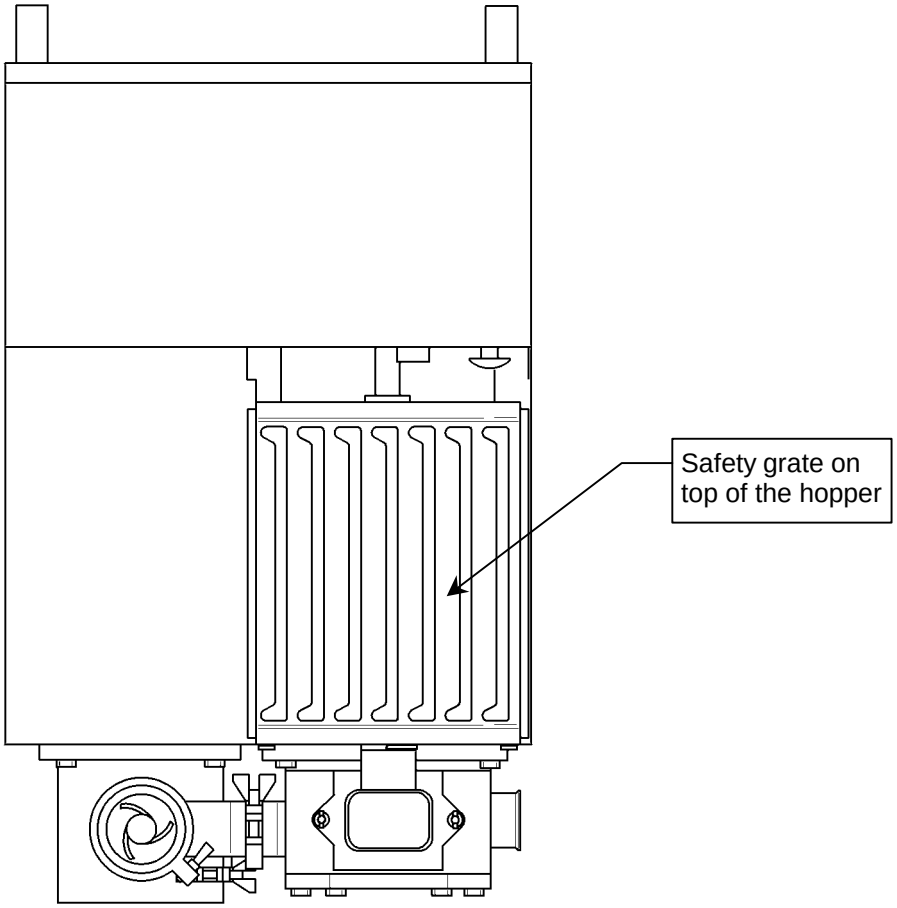


Fig. 2 – Filling the hopper

1.1.14 RESIDUAL HAZARDS

Following a thorough analysis on the hazards during designing phase all possible measures were taken to remove or greatly reduce hazards for the personnel operating the machine.
However few hazards of lesser importance remain and are listed below in order to inform the personnel.
Warning safety signs are shown to signal all residual hazards still existing on the machine.

HAZARD	COMMENTS AND WARNINGS
HAZARDS TIED TO WARNING SIGNS	All operator's attention (production, control, maintenance)is drawn on the necessity to strictly observe the signs on the machine, control panels as well as signal lamps. Such operators must be skilled to intervene in case of necessity. By no means warning signs can be removed or put out of order. They are to be periodically checked by a person in charge and possibly replaced.
HAZARD OF FLUID EJECTION	The operators in charge of the maintenance must, before any intervention takes place, check that there are no residual pressures inside the circuits they have to operate. The first components that should be disassembled must be loosened in order to notice incidental residual pressures.
HAZARDS ARISING FROM MOVING PARTS	The operation of units such as fillers, suckers, stick feeders, pulling out, involve some mechanical risks due to their relatively high speed. Before carrying out any operation on or close to any mobile part of those units, the machine must be stopped and all power supplies shut off. The operator must ensure that anybody in machine proximity noticed that power supply has been shut off. Any place where either rotating or lowering or lifting movement take place is normally covered with a protection. Never remove these protections. Never try to reach any machine part by-passing the protection. Mould movement is a stepped one. This could cause unexpected reaction, if anyone interferes incorrectly, and arms or hands could get wounded. Never try to touch mould surface and never try to remove damaged products from the moulds while the machine is running. The machine must be stopped and disconnected from power supplies before carrying out any kind of work. Maintenance operators, that must carry out works on kinematics components (gear-motor, oscillator, actuating rods, toothed wheels, ratchet wheels, etc.) while side covers are removed, must before starting their work stop machine operation, disconnect the main switch on the switchboard and lock it taking the keys with them. They also have to fix a sign on the board reading “under maintenance”. Should the maintenance personnel need to start a part of the line while protections are removed, they have to ban the access to the area around the line to third party by means of actual barriers (chains etc.) bearing the signs “under maintenance, do not get beyond” and control on site to prevent anyone from approaching. They must reassemble and lock all protections removed from maintenance.

HAZARD TIED WITH ADJUSTMENT WORKS OR FAULT FINDING WORKS TO BE ACCOMPLISHED WHILE THE COVERS ARE REMOVED	Sometimes it becomes necessary to carry out fine adjustments with removed covers and without the possibility to shut off power supplies. In these cases it is necessary to respect the following precautions: - stop machine operation; - proceed with maximum caution; - inform both production and maintenance personnel about the work is going to be carried out; - place a warning notice (DON'T TOUCH - ADJUSTMENT IN COURSE) on the control panel; - complete adjustment quickly; - before starting any machine movement to check adjustment results, ensure that all tools were removed and anybody is close to the zone without protections; - as soon as adjustment operations end, close all covers and reset all safety means that were removed.

HAZARDS DUE TO ERRORS OR HUMAN BEHAVIOUR	Anyone bound to operate the line (production operator, maintenance or control operator) must be properly trained, should have read and understood the content of the present handbook and should know how to operate in case of emergency.

HAZARD DUE TO INEFFICIENCY OF SAFETY SYSTEMS	To avoid all hazards due to inefficiencies in the safety systems make sure to check periodically its correct functioning. Specifically, carry out a weekly check of mushroom shaped emergency buttons, by pushing them one after the other and verifying that line stops as established. Should any safety, starting or stopping device work improperly, the operator must avoid using the machine.

RISK OF POLLUTION DUE TO DISCHARGES	The polluting discharges are: - warming waters for pulling out and washing or rinsing groups; - the dirt collected by the filters; - the brine and other chemical products (liquid or gaseous) used in the machine; These products cannot be directly discharged into drainage systems or the environment, but they must be collected and disposed through a specific treatment. This must be done under full responsibility of the User; GRAM EQUIPMENT declines any liability for environmental damages caused by non suited discharge treatment or disposal.

HAZARDS CONNECTED WITH CLEANING WORKS	Please, see what mentioned at relative Paragraph.

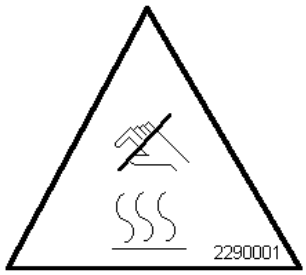
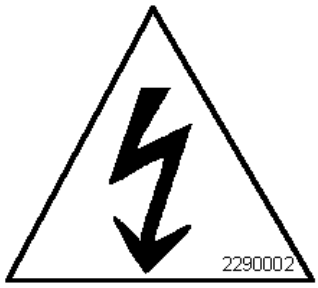
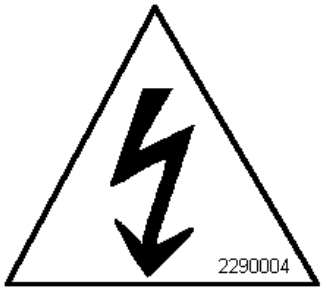
HAZARDS CONNECTED WITH ELECTRIC ENERGY	On machines all electrical equipment, solenoid valves, resistors and electrical panel are supplied with electric energy and, therefore, they are dangerous. All panels, switchboard and distribution box must be correctly closed. The cables must not be damaged or dangle, rather they must be correctly shortened and pulled. Any work on the electric system must be carried out just by qualified personnel and with electric power supply switched OFF. In order to prevent unwanted connections, the main switch must be OFF and suitably locked by a keypad.

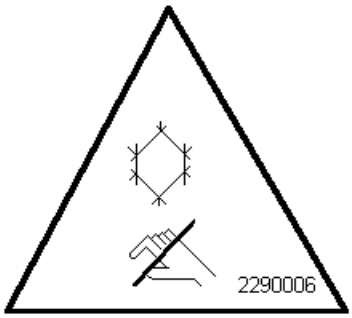
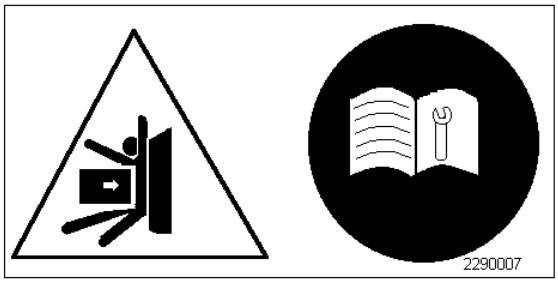
1.1.15 SAFETY SIGNS

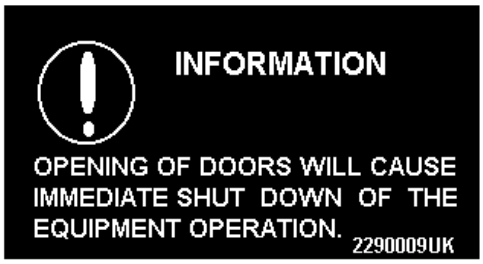
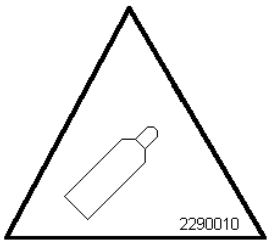
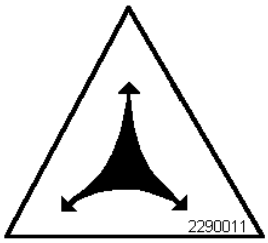
Safety signs to be stuck onto a GRAM EQUIPMENT IF 2000, are shown below.
A safety sign must be replaced by a new one when:

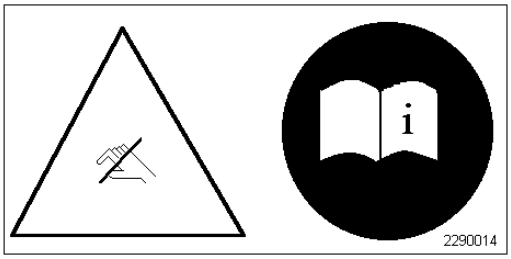
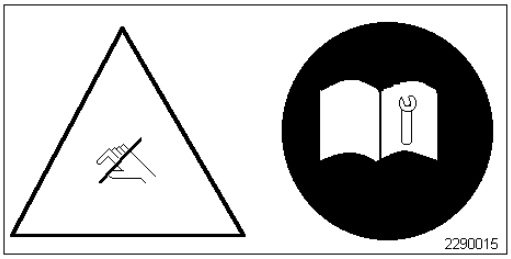
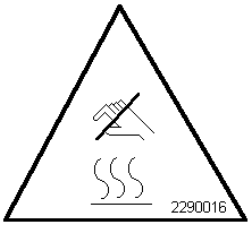
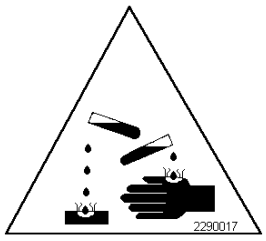
1) it has come off;
2) it is worn;
3) it is loose;
4) it is illegible in any way.

The surface has to be dry and clean when sticking a new sign onto the machine.
When re-ordering new signs please state the article number placed in the bottom right-hand corner of the sign.

Code and description	Machine position	Notice
Code: 2290001 Warning! Risk of burning Don't touch!	**1**	
Code: 2290002 Warning! High voltage Dangerous electrical current	**2**	
Code: 2290003 Risk of hand to be cut. Dangerous spot where hands/fingers could be cut/crushed by movable machine parts	**3**	
Code: 2290004 High voltage Dangerous electrical current	**4**	

Code and description	Machine position	Notice
Code: 2290005 Risk of hand to be cut. Dangerous spot where hands/fingers could be cut/crushed by movable machine parts	**5**	
Code: 2290006 Warning! Risk of freezing Don't touch!	**6**	
Code: 2290007 Risk of remaining caught.	**7**	
Code: 2290008UK Text warning. English version.	**8**	

Code and description	Machine position	Notice
Code: 2290009UK Text warning. English version.	**9**	
Code: 2290010 Warning! Pressure container.	**10**	
Code: 2290011 Warning! Pressure conduct.	**11**	
Code: 2290012 Warning! This pipe contains ammonia.	**12**	
Code: 2290013 Warning! Freon in this pipe.	**13**	

Code and description	Machine position	Notice
Code: 2290014 Dangerous interference. See instruction manual.	**14**	
Code: 2290015 Dangerous interference. See instruction manual.	**15**	
Code: 2290016 Warning! Risk of burning Don't touch!	**16**	
Code: 2290017 Warning! Risk of corrosion.	**17**	

1.1.16 PLACING OF THE SAFETY SIGNS

A number of safety signs and pictogrammes are placed on the IF 2000 and the placing is illustrated below.

The signs must always be placed as illustrated below. If this is not the case, new signs are to be placed on the machine.

Furthermore the signs are not to be loose or illegible.

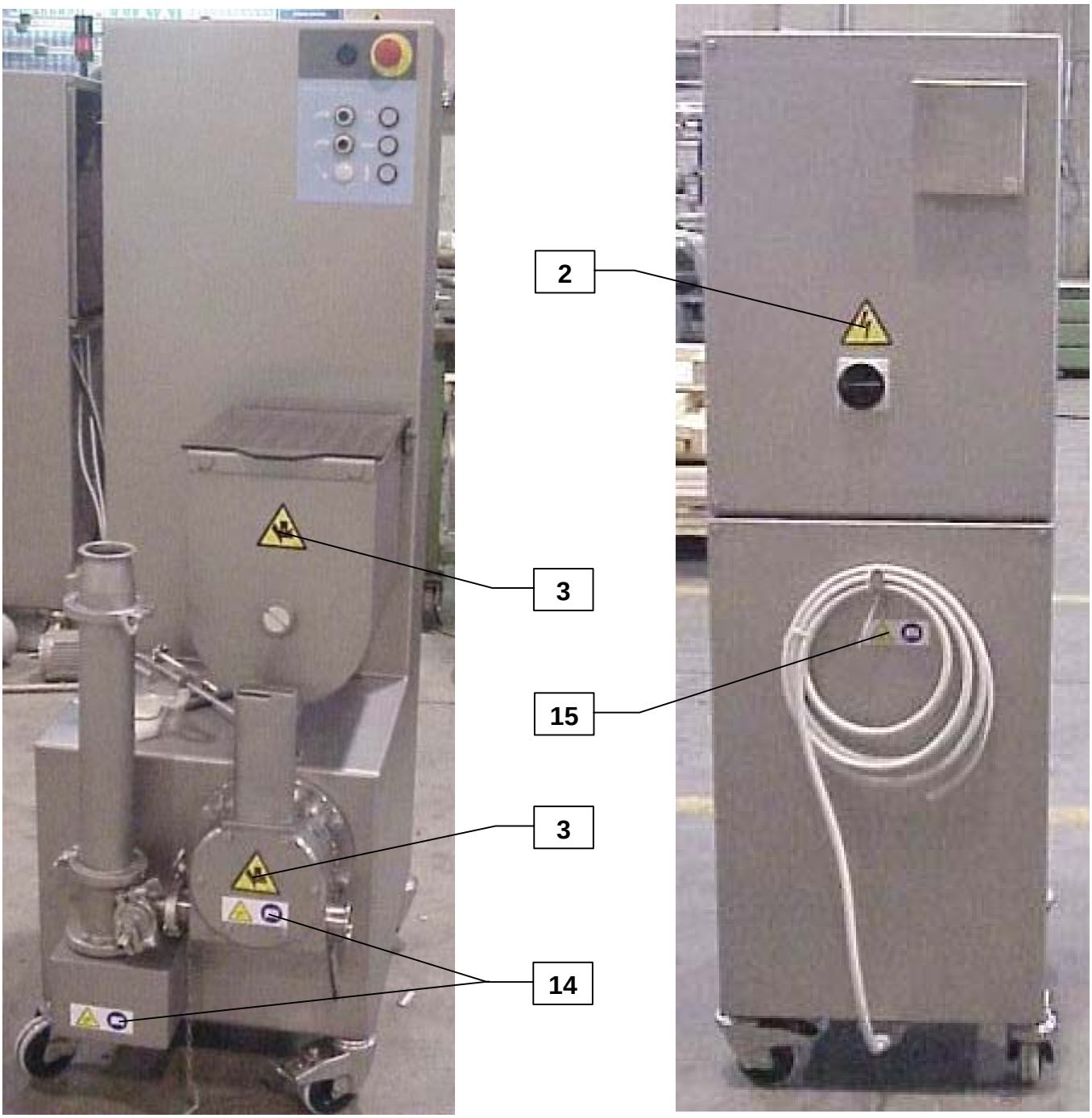


Fig. 3 – Placing of the safety signs

1.2 MANUAL

1.2.1 INFORMATION ABOUT THE MANUAL

We hope that the information included in this manual can help You.
It aims to give an explanation about the right and safe use of Your machine and are based on data as well as on our best up-to-date knowledge.
Read carefully what is written on this manual, included the recommendations and suggestments, as well as the sale and guarantee conditions.
Gram Equipment has edited this manual with the maximum care, trying to make it as complete and clear as possible. However, should any point be incomplete or unclear, please contact us without hesitation.

1.2.2 MANUAL IMPORTANCE

This instruction manual has been conceived to help You install correctly, set-up, use and maintain Your machine.
Special importance has been afforded to the operators safety, describing in detail the protection devices and the procedures for a safe use of the machine.
We ask You to consider this manual as an actual part of the machine, in order to obtain the best performances. We suggest in particolar to:

- Keep the manual for the whole life of the product;
- Make sure that any possible revision is included in the text;
- Make this manual be easily available for consultation by the various operators (if necessary, make a copy of the needed parts);
- Deliver the manual to any other new user or step-owner of the machine.

The aim of this manual is to explain:

- the equipment utilization according to the design;
- the technical specifications;
- the structure of the different components (mechanical and electrical);
- the handling, installation and assembly operations;
- the setting up, adjustment, starting up, stop, off-line operations;
- the dangerousness associated with residual risks, the measures to remove it and the instructions to work safely;
- maintenance interventions to be performed at pre-arranged intervals in order to ensure total efficiency of the equipment during the years;
- extra maintenance interventions;
- suggested spare parts to be kept in stock.

ATTENTION!
Any person charged by the Customer with installation, start-up, exploitation, maintenance and repair of this machine, must be aware of this manual content, with specific reference to safety rules.
If the person involved should not understand the language in which the Manual is written, the Customer must train him in adequate manner.

The instructions given in the present Manual must not be intended by any means as a substitute, an integration, or a modification of any PRESCRIPTION, DECREE OR LAW either general or specific in force in the country where the installation takes place and which relates to safety, use and maintenance of mechanical, electrical, chemical, hydraulic, pneumatic equipment, plants or others.

This Manual addresses to the Maintenance Department staff and gives suggestions and advice on how to make interventions on the plant but the skilfulness and general qualification of the maintenance staff in facing any problem of mechanical and electrical maintenance is taken for granted.

GRAM EQUIPMENT, if not otherwise specified in the order, will supply a copy of this Manual in the language of utilization country together with the machine.

This copy will be included into the shipment or will be carried along by the man in charge of the erection and it will be used for all operations connected with installation, internal transports, lifting, placing, anchoring, assembling, setting, preparation and start up.

After completing the erection, this copy has to be kept for all maintenance works.

GRAM EQUIPMENT will be pleased to provide copies of the Manual supplied with the equipment for any customer’s requirement.

Applications should be addressed to our Design Dept. along with the characteristic data of the equipment involved as detailed on the EEC labels

This Manual, the technical specifications and the drawings delivered together with the equipment are exclusive property of GRAM EQUIPMENT, all rights are reserved, therefore they can be available for no one else.

GRAM EQUIPMENT will be happy to examine and to accept valid suggestions aimed at improving this handbook.

Suggestions must be presented to our Engineering Department.

In case he transfers the machine to third people, the user also engages to transfer the copies of this handbook in his possession and, at the same time, to inform GRAM EQUIPMENT of the above.

1.2.3 USE FORESEEN FOR THE MACHINE

The machine is devoted to a general usage from specialised operators, that, before starting to operate the machine, must be adequately instructed, in particular by reading the content of the present Manual on machine constitution and operation, as well as on all control and safety devices.

Operators must be also trained on residual risks associated with the use of the machine and must be prepared on interventions to prevent any injuries to themselves, third party, damage to goods and to the environment in general.

Operators and maintenance personnel must also be trained on the fact that chemical products are used in the machine.

Particularly, operators must be aware of all means of protection to wear in any handling involving chemical products.

They must also be trained to adopt first aid measures in case, notwithstanding caution provisions, parts of their body should come in contact with harmful material or if its exhalations are inhaled, etc.

To this matter, GRAM EQUIPMENT warns that, as the choice of chemical material type to be introduced into the machine lays on the user solely, he has to collect the instruction (including all possible danger signalling label to be applied on machine parts) on handling care, protection and first aid means from his suppliers, as they will depend on each product composition. It will be the user's concern to check the personnel qualification and to assure that the suggestions and instructions are respected.

The intended use of the machine is to mix fruit and nougat up, and then to dose them into the ice-cream.

The user undergoes the compulsory obligation to collect and send to disposal any waste material that may not be recycled on the same installation.

Operators and maintenance personnel must be trained and made sensitive to this matter also.

Machine start and adjustment usually carried out by one or more line operators.

In the second case, i. e. when several person are operating on the line at the same time, the level of caution must be higher and higher in performing all manoeuvres, and before executing any command through a keyboard make sure that nobody is in danger at that time.

The machine has been conceived for completely automatic running.

1.2.4 BASIC WARNINGS

- Figures and drawings have to be intended only as generic references and are not necessarily thorough in every detail.
- Dimensions and characteristics reported in this manual are not binding and they could be modified without notice.
- No part of this manual can be reproduced or transmitted to outside parties without written consent by GRAM EQUIPMENT S.r.l.

1.2.5 CONSULTATION

Structure

The manual is divided in three sections:

1) Installation, use and maintenance instructions, as well as those about the risk zones signalings and safety rules.
2) Spare parts catalogue.
3) Information about complex commercial components installed on the machine (the description of the commercial components installed on the machine is available in the supplied cd-rom, attached to this manual).

Warning notes

In addition to parts enhanced to give special prominence to characteristics or technical infotmation, the following notes are very important:

- Safety notes, that refer to possible dangers for the operators and to the rules to minimize the risks, introduced by the signal:

- Warning notes, that refer to operations to be done or avoided for a good functioning of the machine, introduced by the signal:

1.2.6 CONSERVATION

We advise Yuo to keep this manual with the maximum care for the whole life of the machine.
Some useful suggestions for a perfect conservation are:

- Shelter the manual against humidity and heat;
- Use the manual correctly, not to damage, neither wholly nor partly, its content;
- Do not remove of tear for any reason parts of the manual;
- Make a copy of the parts needed for consultation by the various operators;
- Do not overwrite for any reason parts of the manual, unless in case of late revisions by GRAM EQUIPMENT S.r.l.

1.2.7 PREFACTORY NOTE

The intention with this technical manual is to secure an optimum operation of the IF 2000.
At the same time the operators should be able to operate the machine without being endangered.
Therefore it is important that every operator, invol-ved in the operation of the machine, has read and understood the whole instruction technical data.
Operators are both persons, who are installing and connecting the machine as well as persons, who are operating and cleaning the machine every day and persons, who are performing service, repairs and maintenance on the machine.
Especially make certain that the operators are fami-liar with the presentation, placing and meaning of the safety instructions.
Furthermore we recommend that the operators are conversant with first aid, the local first aid facilities, their placing and presentation.
While the machine is operated, there are dangerous, movable, rotary and live parts on the machine.
Illegal removed covers and screenings as well as safety signs, placed on the covers and screenings, or insufficient maintenance, might result in severe injuries or damages.
The instruction manual must always be available to the operators.
Always keep a copy of the technical data, in case the instruction technical data in use gets worn or disappears. A new instruction manual is ordered from Gram Equipment.

1.2.8 LIMITS TO APPLICATION

The machine is a feeder, designed for dosing and mixing solid as well as moist flavourings into ice cream, such as nougat, pieces of fruits, pieces of chocolate, jam a.m.
When using the machine for other purposes as mentioned above, without obtaining previous per-mission from Gram Equipment, this happens without responsibility on our part.
Therefore we recommend always to consulting Gram Equipment, before performing alterations on the machine for manufacturing products, which are not mentioned in the description of the machine.

PLEASE NOTE!
NEVER USE THE MACHINE FOR PURPOSES, WHICH ARE NOT APPROVED, BECAUSE IT MIGHT ENDANGER THE OPERATORS AND DAMAGE THE MACHINE.

2. TECHNICAL DATA AND IDENTIFICATION

2.1 IDENTIFICATION DATA

A tally stuck on the machine reports the data which unequivocally identify your plant or equipment. These data are the following:

1) type and model;
2) order number;
3) power supply;
4) year of construction.

Gram Equipment

COSTRUTTORE MANUFACTURER FABRICANT BAUER

CE

C & G S.p.A.
Stabilimento di Cormano
Via Fabio Filzi, 37
20032 CORMANO (MI) – ITALY

MACCHINA EQUIPMENT MACHINE MACHINE	**FRUIT FEEDER IF 2000**
MATRICOLA SERIAL NUMBER MATRICULE REGISTRIENNUMMER	
ALIMENTAZIONE POWER SUPPLY ALIMENTATION SPEISUNG	
ANNO YEAR ANNÉE JAHR	

In case you contact Gram Equipment for information or spare parts concerning this machine, inform us these data in order to get everything you require as soon as possible and error-free.

The voltage of your machine is properly marked. Be certain that your power supply is the same before carrying out the installation.

2.2 COSTITUTION OF THE MACHINE

N.B.: The terms right and left, anterior and back, used in the description must be intended always as established observing the car from the eletric panel of control .

2.2.1 TECHNICAL DATA

2.2.1.1 INDICATIVES DIMENSIONAL DATA

Height machine	~ 1528 mm
Width machine	~ 480 mm
Lenght machine	~ 790 mm
Gross weight	230 kg
Net weight (empty hopper)	200 kg
Container volume	30 l ~ max. 35 kg
Ice-cream capacity	150-2000 (l/h)
Ingredient capacity	15-200 (l/h)

2.2.1.2 SPECIFIC TECHNIQUES

Voltage	380-415 V – 50-60 Hz
Power	1,3 kW – 6 A
Motor servo-fan	2 x 41 W – 0,12 A
Motor pump	0,37 kW – 1,05 A
Motor screw agitator	0,37 kW – 1,05 A
Motor after mixer	0,37 kW – 1,05 A
Speeds of rotation: Feed pump After mixer Shaker Auger	 1-15 (r/min) 90 (r/min) 2,5-38 (r/min) 10-150 (r/min)
Feeding quantities of auger: Auger: full blade Ø 45/20	 0,025 (l/r) (*)
Connection of ice cream: Inlet Outlet	 2” clamp 2,5” clamp

(*) The dosed quantity is based on a filling of 80%
(**) Depending on the speed of the auger.

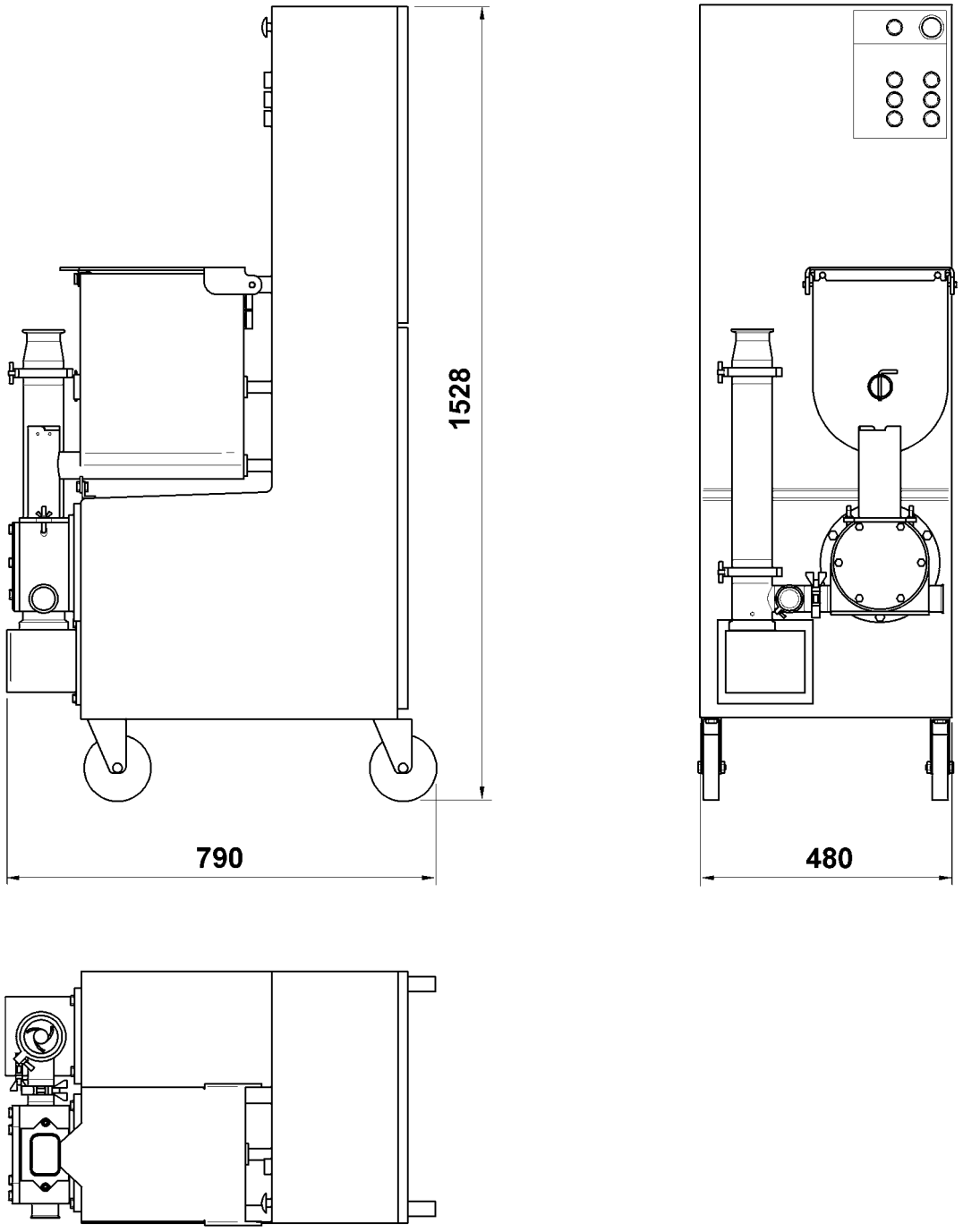


Fig. 1 – Technical data

3. DESCRIPTION OF THE MACHINE

3.1 GENERAL DESCRIPTION

The IF 2000 is a modern Ingredient Feeder constructed and produced to meet all the demands as regards hygiene, service and safety.
The machine is constructed for dosing different flavourings as nuts, almonds, chocolate and other dry material normally mixed into ice cream.
Furthermore the machine is able to operate with moist material as pieces of fruit, marmalade and raisins in rum a.o.
The machine is a total manually controlled feeder, where the quantity of the ingredients, are controlled by the speed of the auger and the rotation of the feed pump.
The motors for the auger and the feed pump are frequency controlled and the desired dosing takes place by adjusting the speeds by means of potentiometers placed on the front of the switchboard.
The speed of the shaker is depending on the speed of the Auger, as they are combined 1:4. This means that every time the auger makes four rotations, the shaker make only one.
When running with products that do not need to be stirred in, the shaker can easily be taken out of the hopper.
After the flavouring has been added to the ice cream by the feed pump, the mix is led to the succeeding mixer, which gently mixes the ice cream and the flavouring into a uniform ice cream mix
The machine is as standard delivered with a single-speed mechanical after mixer.

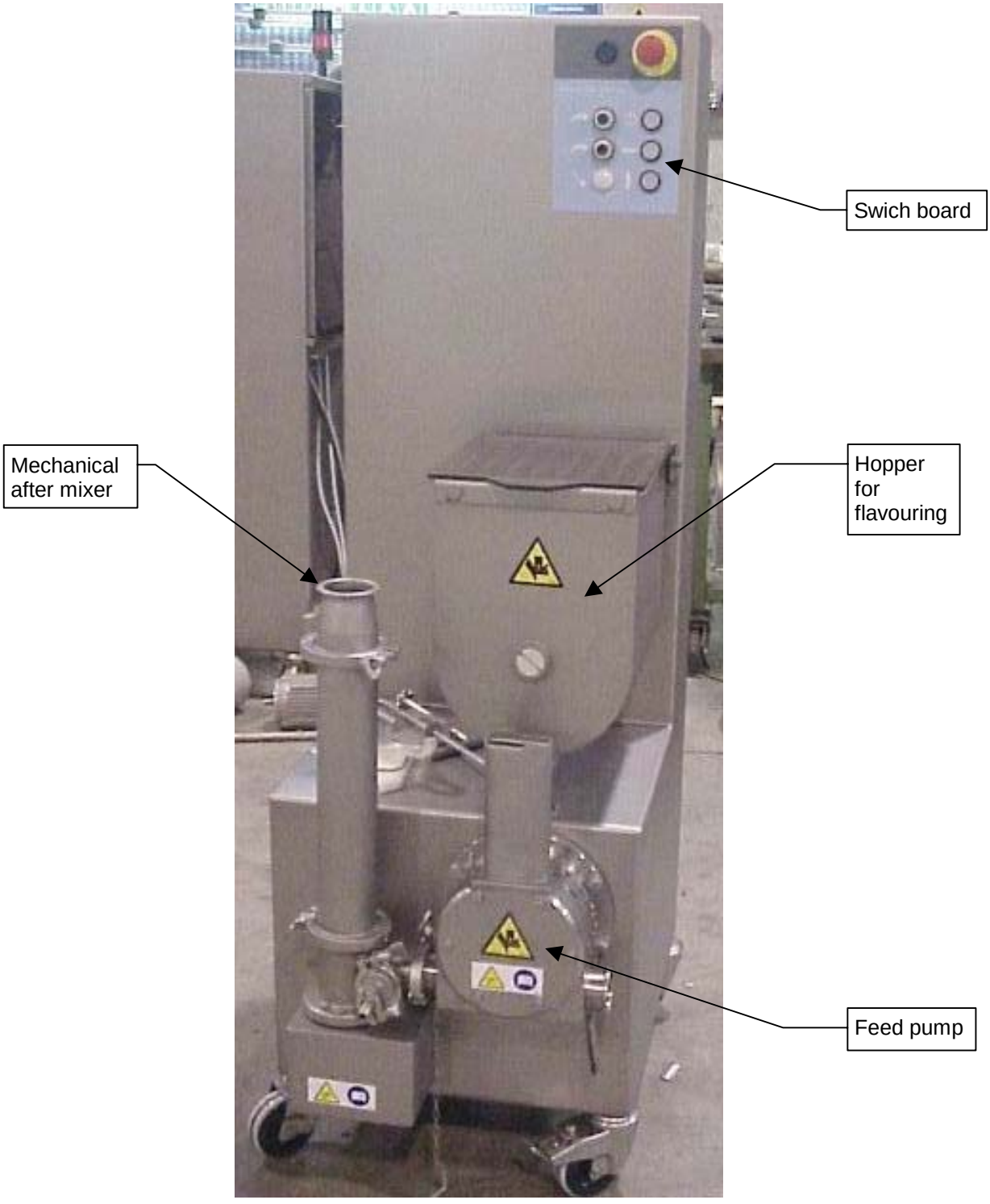


Fig. 1 – General description

3.2 "STRACCIATELLA" INLET DEVICE (OPTIONAL)

The machine is equipped with a device for "stracciatella" inlet (Fig. 2 pos. A) (optional) located between the mixer (Fig. 2 pos. B) and the supply pump (Fig. 2 pos. C).
For the installation of this device it's required to open the clamp (Fig. 2 pos. 1) to remove the plug (Fig. 2 pos. 2) which must be replaced by the inlet manifold (Fig. 2 pos. 3) as pointed out in the drawing shown below.
Install moreover the rubber holder (Fig. 2 pos. 4) with the clamp (Fig. 2 pos. 5). Ensure that during the installation of the device the gaskets (Fig. 2 pos. 6-7) are properly placed into their prearranged seats.

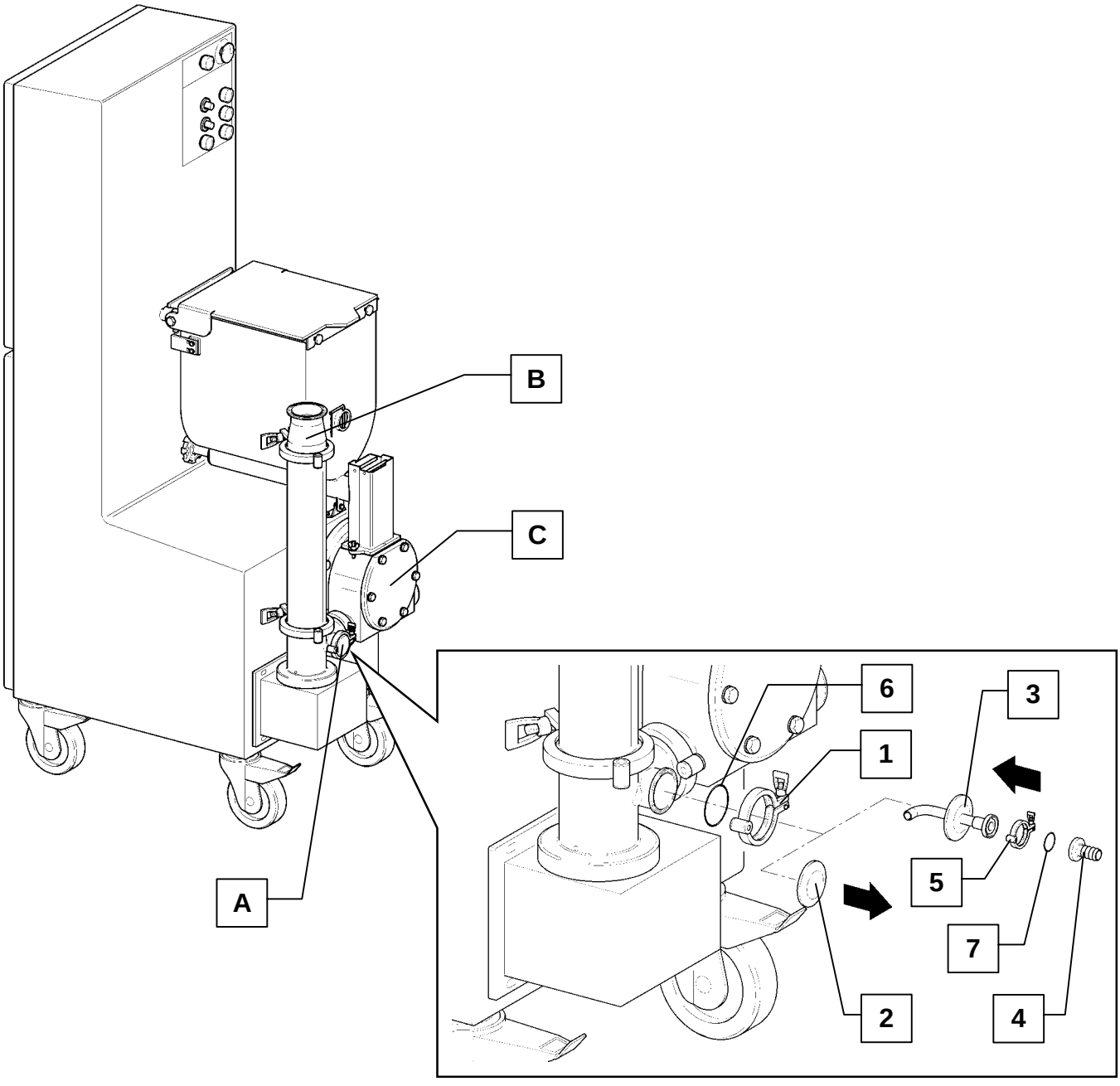


Fig. 2 – "Stracciatella" inlet device (optional)

3.3 SAFETY MICRO-CONTACT

Machine is equipped with a safety micro-contact (Fig. 3 pos. 1) located in correspondence of protection pan (Fig. 3 pos. 2) and of hopper (Fig. 3 pos.3).

This micro-contact (Fig. 3 pos.1) provides to stop machine functioning in case of accidental opening or voluntary of the protection (Fig. 3 pos. 2).

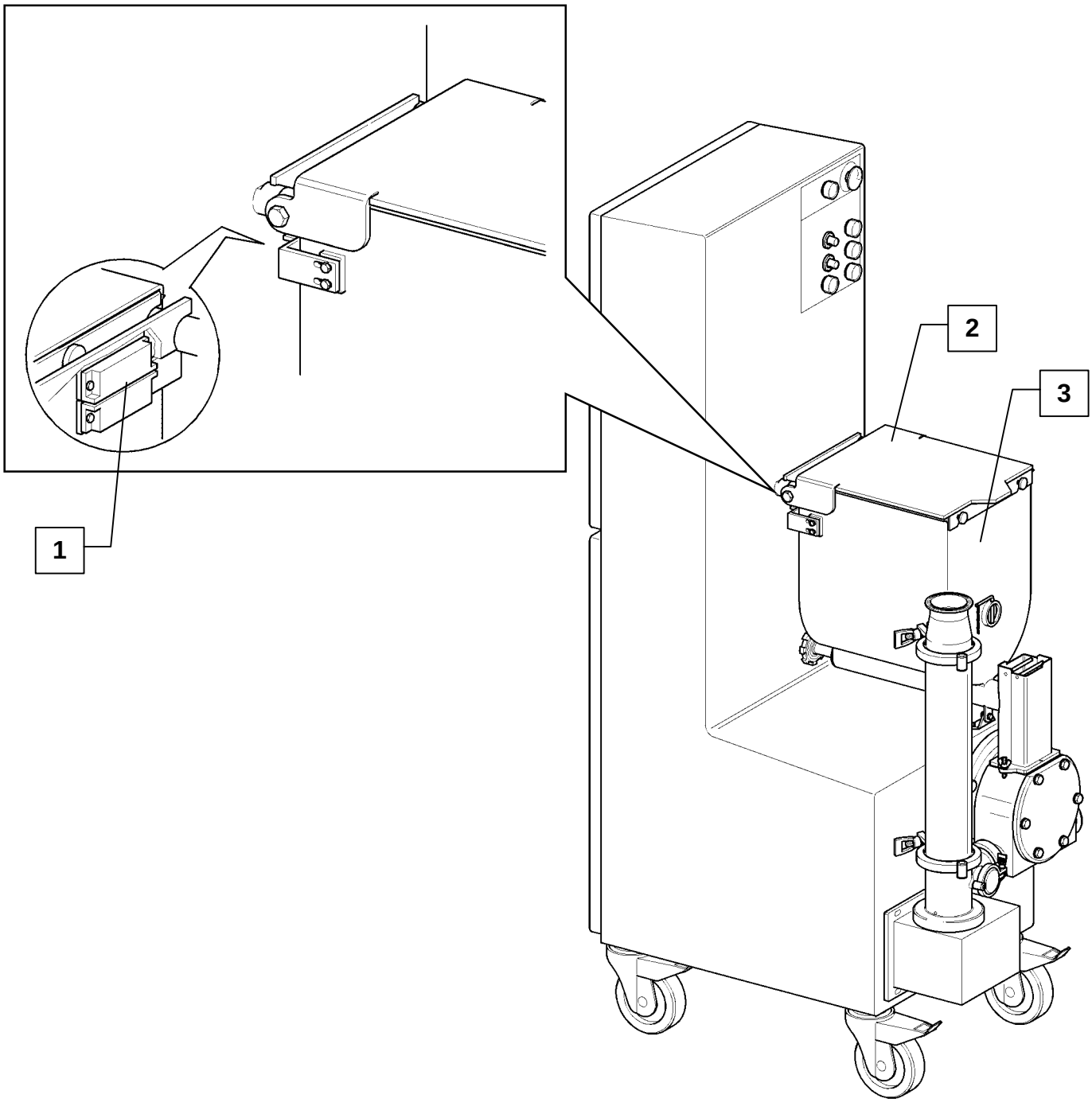


Fig. 3 – Safety micro-contact

3.4 CAPACITIES FOR IF 2000

The capacity of the IF 2000 is determined by the speed of the auger and the capacity of the feed pump as well as the quantity of ice cream that can pass through the feed pump.
The area of capacity of the feed pump, is between 15 - 200 (l/h), at a filling of 80%.
The quantity of ice cream passing through the feed pump is dependent on the counter pressure from the nest of tubes, the feed pump itself and the succeeding mixer.
The minimum quantity of ice cream to be operated with is approx. 150 (l/h) and the maximum quantity of ice cream is 2000 (l/h).
The diagram below shows the actual working area of the IF 2000.
On the horizontal axis, (the axis of abscissas) in the diagram, the quantity of ice cream passing through the feed pump is shown, where the actual working area is between 150 (litres of ice cream/h) to 2000 (litres of ice cream/h).
Based on a given percentage of flavouring, illustra-ted by the skew lines in the diagram, the quantity of flavouring supplied to the ice cream can be seen on the vertical axis (the ordinate axis).

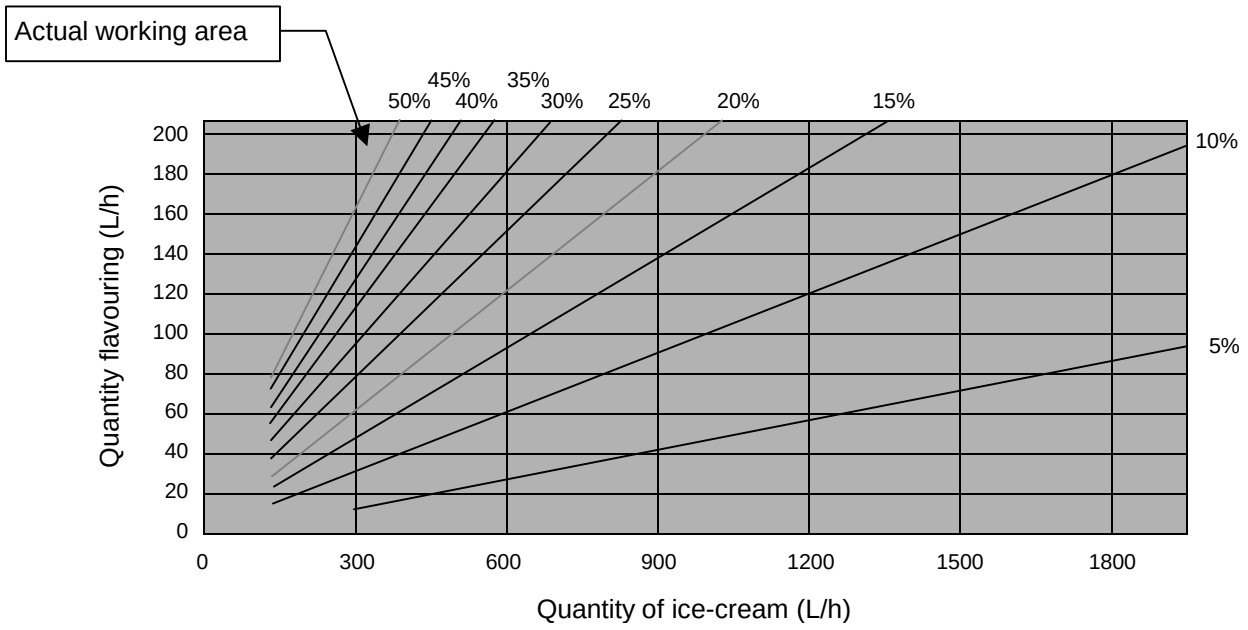
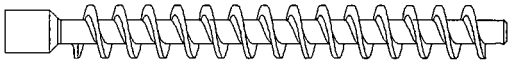


Fig. 4 – Capacities for IF 2000

3.5 AUGER FOR THE IF 2000



Worm: Full blade Dia. 45/20

Area of use:
Jam products
Jam with/without whole berries

Products as:
- Black currant jam
- Raisins in rum
- Jelly

Granules as:
- Pieces of nuts
- Chopped almonds
- Chocolate pieces

Furthermore an shaker with 3 arms is delivered together with the IF 2000.

3.6 ELECTRIC PLANT

The IF 2000 is constructed with a control panel from which the different units on the mahine can be completely controlled.
The placing of the control panel and how it is arranged appears from the below illustration.
In order to start the machine, the main switch, placed at the bottom of the switchboard, must be switched to ON and the Emergency stop Rest button must be pressed.
Here after the IF 2000 machine is switched on by pressing the ON-button on the control panel, for the feed pump, shaker/screw or the mechanical after mixer.
The speeds of the auger/shaker and the feed pump are now continuously variable and can be regulated by means of the adjusting knobs for the drives in question.
Turn clockwise in order to increase the speeds of rotation.
By turning the knob home (counterclockwise), the single units will stop completely.

PLEASE NOTE!
THE COVER OF THE FEED PUMP MUST BE PROPERLY MOUNTED TO SECURE THAT IF IS TIGHT DURING OPERATION WITH ICE CREAM.

PLEASE NOTE!
NEVER START THE SINGLE UNITS BEFORE IT IS SECURED THAT THE MECHANICAL PARTS ARE CORRECTLY ASSEMBLED AND PROPERLY CLAMPED TOGEGHER.
ESPECIALLY THIS GOES FOR THE FEED PUMP AND MIXER.

At every unit on the machine there are a green lamp and a red one.
The green light indicates that the motor is operated and the red light will be switched on in case of a thermal error.
The control panel is also provided with an emergency break which will stop the whole IF-machine immediately when pressed.
In order to restart the machine after an emergency break, the button “Control Voltage ON” must be pressed.
After the daily operation, the OFF-button is pressed to switch off the control voltage to the machine and the control panel.

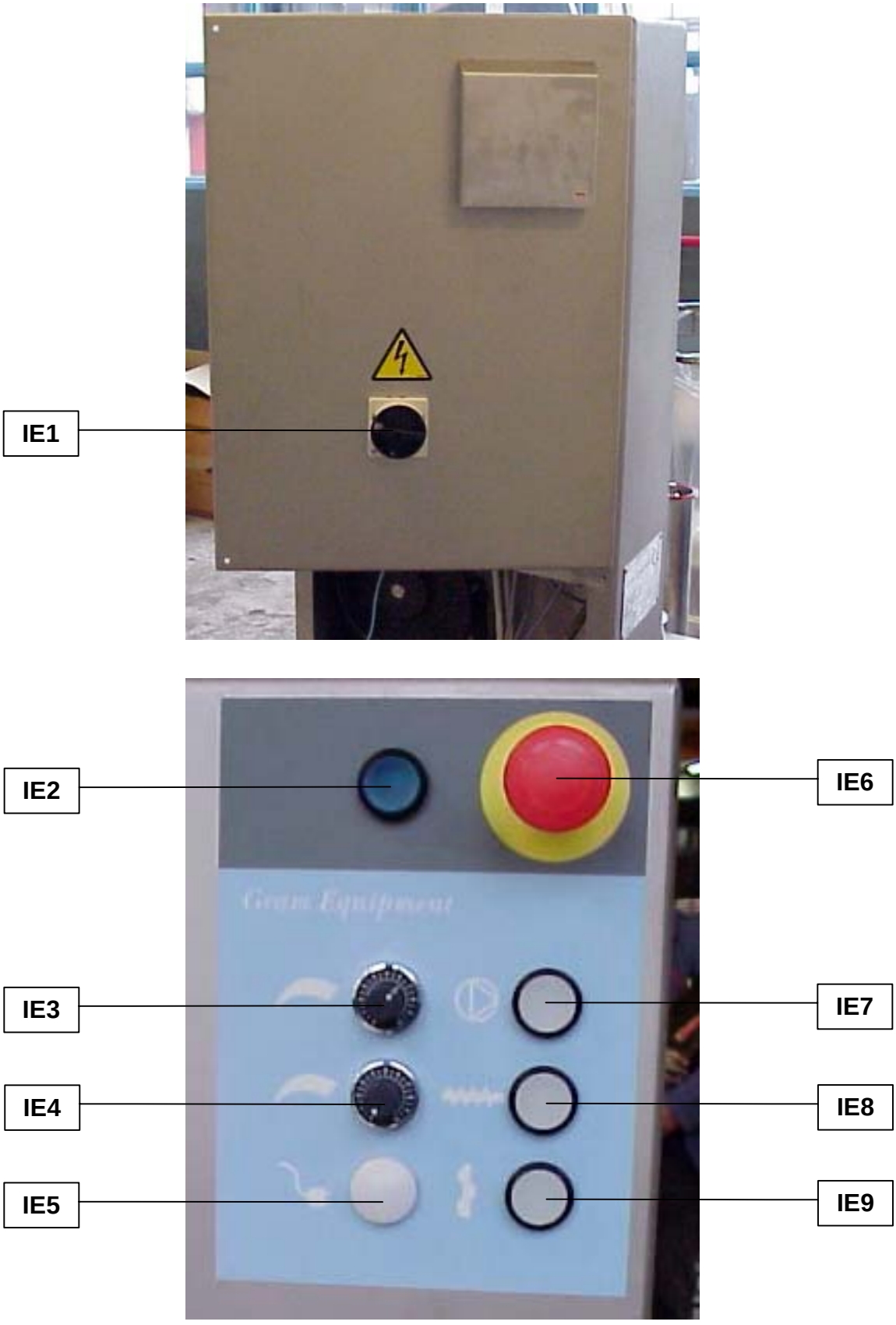


Fig. 5 – Electric plant

REF.	DESCRIPTION
IE1	MAIN POWER
IE2	EMERGENCY RESET PUSH-BUTTON
IE3	PUMP MOTOR SPEED ADJUSTMENT POTENTIOMETER
IE4	AUGER MOTOR SPEED ADJUSTMENT POTENTIOMETER
IE5	POWER ON PILOT LIGHT
IE6	EMERGENCY STOP PUSH-BUTTON
IE7	PUMP START/STOP PUSH-BUTTON
IE8	AUGER START/STOP PUSH-BUTTON
IE9	MIXER START/STOP PUSH-BUTTON

3.7 DESCRIPTION OF ELECTRIC FUNCTIONING (SEE REF. IE7 – IE8 – IE9)

The pushbuttons "**IE7" – "IE8" – "IE9"** have various functions:

1° function: pushing the pushbutton the controlled device starts running. The pilot light inside the pushbutton switches on showing the functioning of the device.

2° function: pushing the pushbutton again, the controlled device stops. The pilot light inside the pushbutton switches off showing the stopping of the device.

3° function: the blinking light inside the pushbuttons shows the presence of an anomaly of the controlled device.
The blinking light of pushbuttons **"IE7"** and **"IE8"** means an anomaly on the inverter (Inverter Fault) or the intervention of a thermic protection.
The blinking light of the pushbutton **"IE9"** means the intervention of a thermic protection.

3.8 SIEMENS INVERTER PARAMETER

PARAMETERS	PUMP	AUGER	DESCRIPTION
P010	1	1	Enable quick commissioning
P100	0	0	Europe/North America
P304	400	400	Rated motor voltage
P305	1.1	1.1	Rated motor current
P307	0.35	0.35	Rated motor power
P310	50	50	Rated motor frequency
P311	1370	1370	Rated motor speed
P700	2	2	Selection of command source
P1000	2	2	Selection of frequency setpoint
P1080	5.5	5.3	Min frequency
P1082	87	81	Max. frequency
P1120	5	5	Ramp-up time
P1121	5	5	Ramp-down time
P3900 SET TO 2			
Check the follow parameters: To enter in the parameters in level 2:			
P0003	2	2	User access level
P701	1	1	Function of digital input 1
P702	12	12	Function of digital input 2
P703	9	9	Function of digital input 3
P2000	87.0	81.0	Reference frequency

4. INSTALLATION

4.1 PACKING

As transport is usually charged to the Customer, it is agreed during order negotiation and it depends from the transportation way chosen the destination distance, as well as from a possible storage period. The Table below shows the most frequently used types of packing, but different types may be used upon specific Customer's request.

Packing ways		
Packing type	**Transport means**	**Destination distance**
Large pallet with wooden walls coated with tarred paper + barrier bag with zeolite	Trailer Ship	Transcontinental Possible storage
Large pallet with wooden cage + possible cover by polyethylene film or similar	Trailer or Lorry	National or international
Standard container + possible barrier bag	Trailer or Lorry Ship	Transcontinental
Special container	Air cargo	Transcontinental
No packing. The items are simply deposited and fixed on vehicle carrying surface and possibly covered with polyethylene film or canvas	Trailer	National or border countries with a trip of few hour

4.2 TRANSPORT

When the IF 2000 machine leaves Gram Equipment, it is wrapped in order to be able to handle the machine without endangering personnel or damaging the machine.
Furthermore it should be possible to transport the machine with a forklift truck or alike.
In case of overseas transport, it is put into a robust wooden box as protection against strokes and mechanical influence.
The IF 2000 is placed and fixed to a pallet, to prevent unintended motion.
There is a steel band around the IF 2000 and the pallet, and wooden blocks are placed around the legs of the IF 2000 machine to prevent the machine from rolling.
Possible loose parts, fittings and spare parts are also fixed to the pallet.
The IF is designed to load the pallet, which it is placed on when it is wrapped, evenly.
This means that there is only a small risk of heeling or tilting, when lifting the pallet by crane or fork-lift truck.
The machine and loose parts are wrapped in plastic foil, fixed to the pallet, to protect them against the weather.
We recommend always to placing the IF 2000 on a pallet for long distance transports.
Always place the IF 2000 on the wheels - do not lay the machine down.

PLEASE NOTE!
LIFTING HOOKS OR THE LIKE, ARE NOT TO BE MOUNTED DIRECTLY ON THE MACHINE.

PLEASE NOTE!
DO NOT PUSH THE CONTROL BOX, AFTER MIXER OR OTHER ELEMENTS ON THE MACHINE.

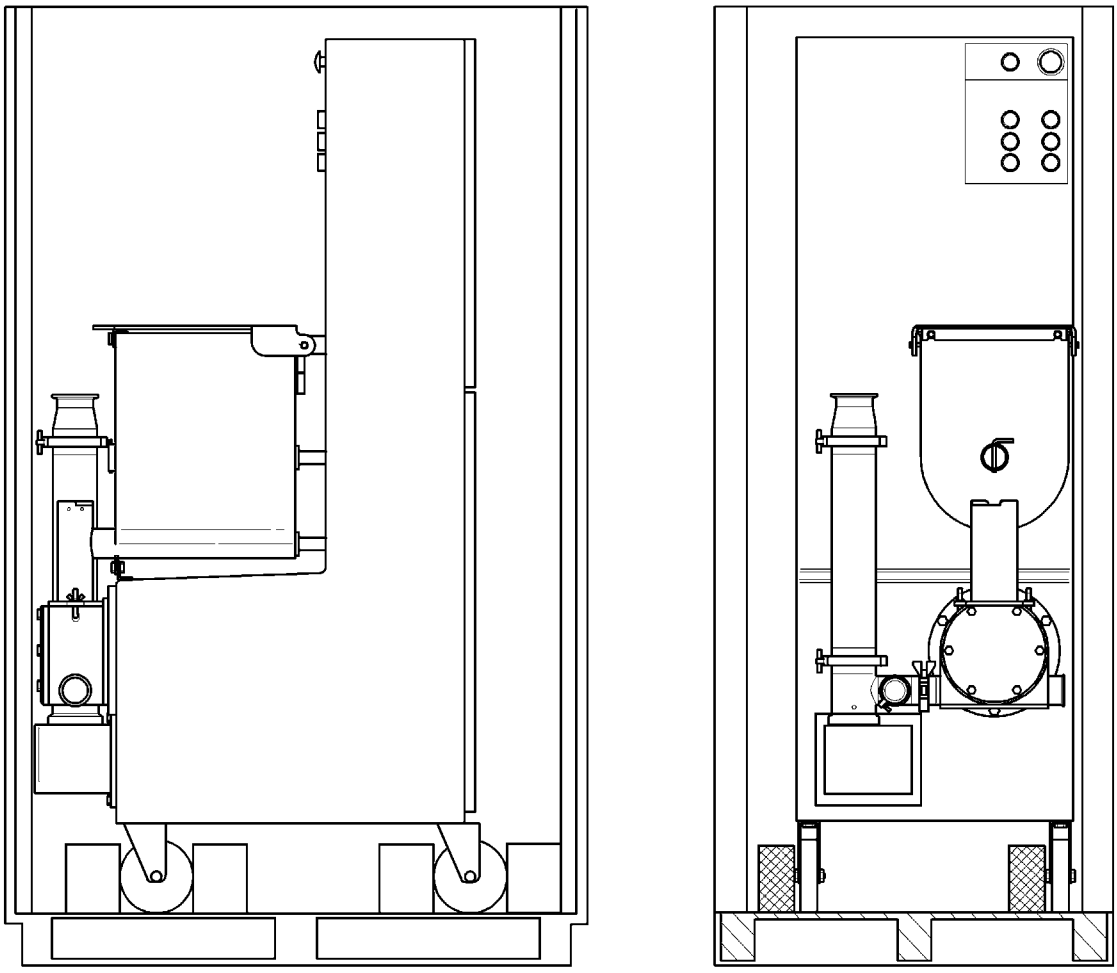


Fig. 1 – Transport

4.3 LIFTING

The machine must be lifted with a forklift truck as illustrated by below figure.
The forks are to be placed immediately under the machine thus the maschine is placed properly on the forks.

PLEASE NOTE!
NEVER LIFT THE NFD-MACHINE WHEN THE BOTTOM LID IS MOUNTED.
THE BOTTOM LID MUST BE DISMOUNTED DURING LIFTS SO THAT THE MACHINE IS LIFTED IN THE BEARERS ON WHICH THE LEGS ARE WELDED.

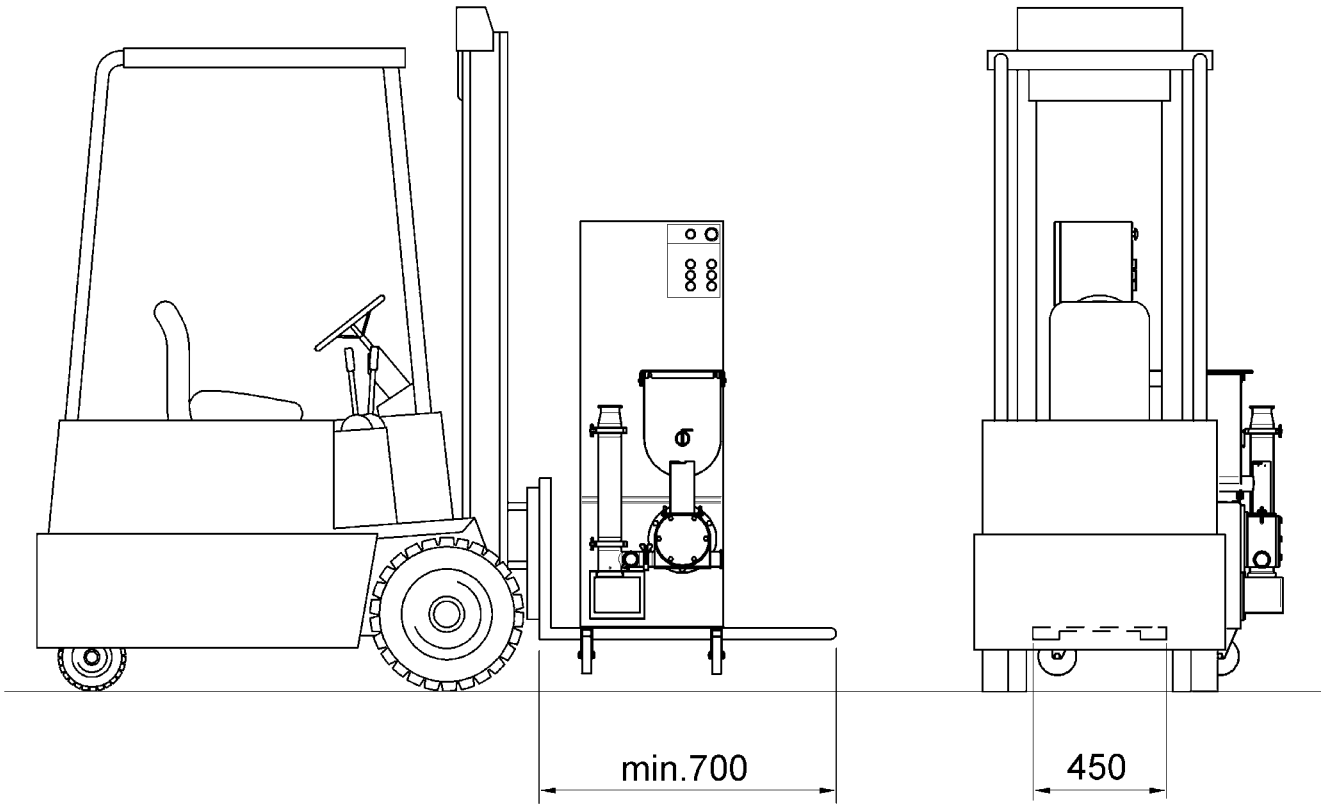


Fig. 2/A – Lifting

When lifting with a crane, the lifting tools must be placed as illustrated by below figure.
The beams of the lifting unit must be placed between the legs of the IF 2000 machine and as close to the legs
on each side to have the longest possible distance between the beams.
This insure that the IF 2000 machine is placed as secure as possible in the lifting crane.

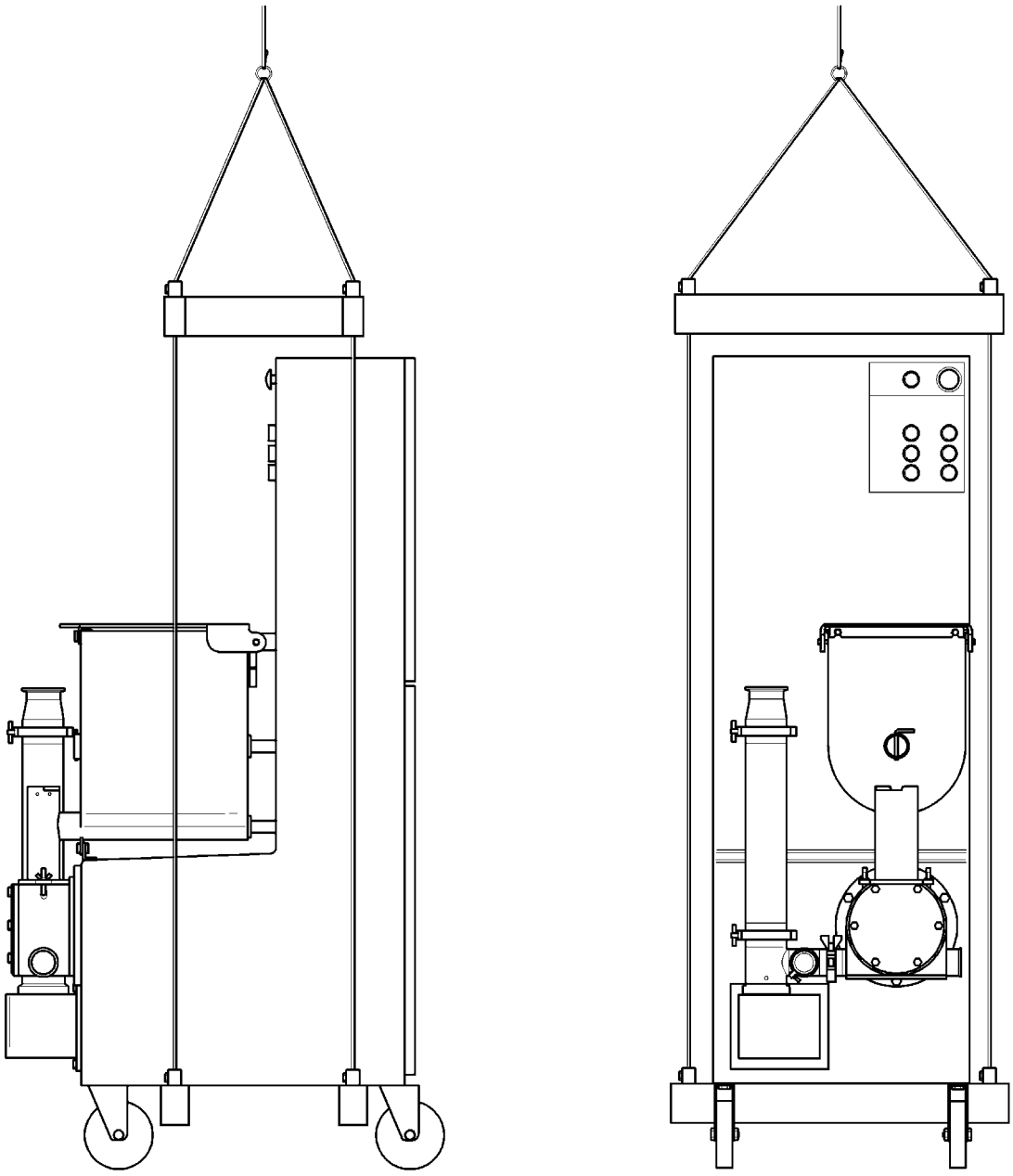
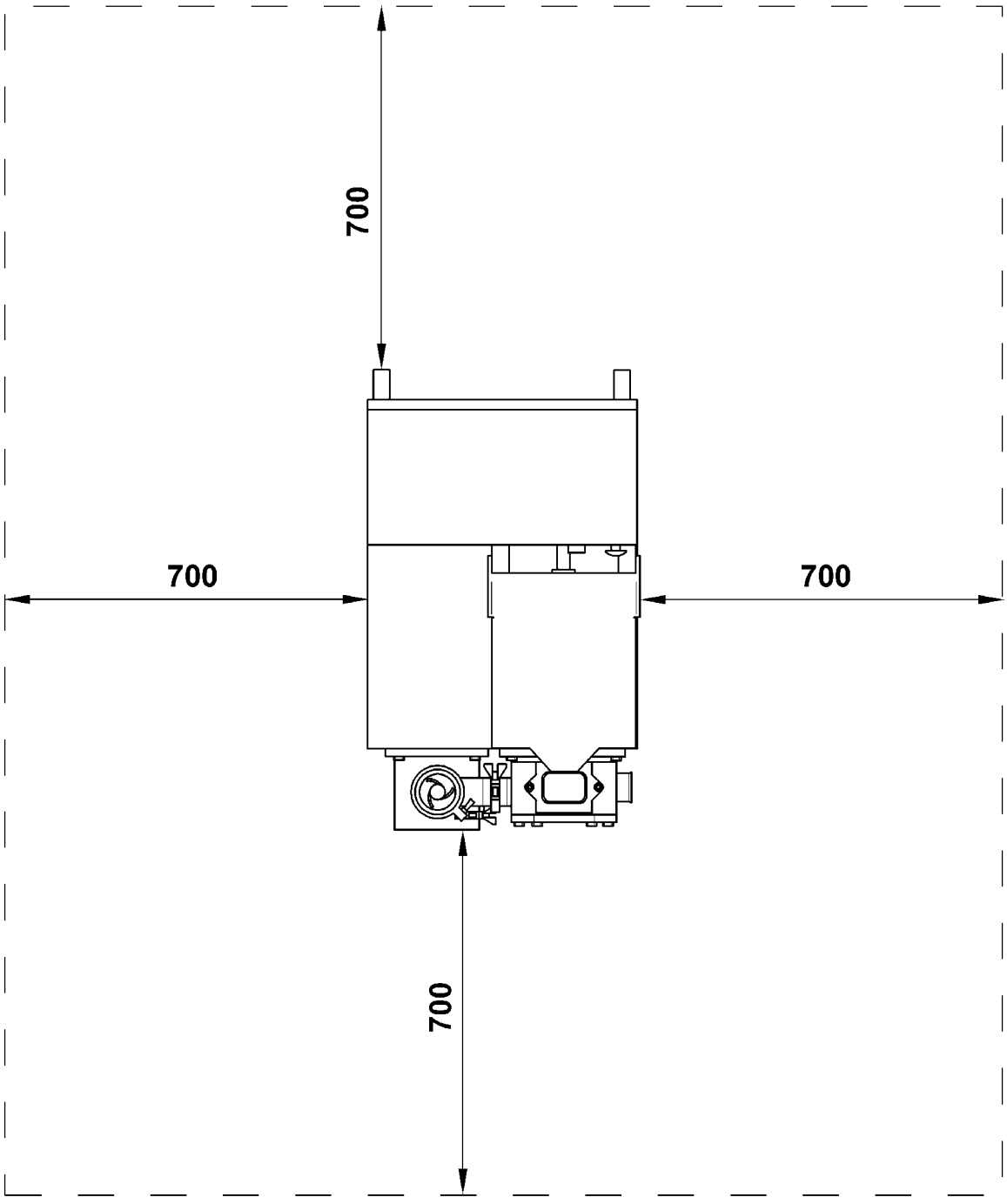


Fig. 2/B – Lifting

4.4 INSTALLATION

The IF 2000 must be placed evenly and horizontally on the floor.
The floor, on which the machine is placed, should not have any holes/cracks, from which it is difficult to remove dirt and other things during the daily cleaning of the machine.
It is easy to clean and flush under the machine when the floor is completely even.
The installation of the machine must be done in such a way, that there is always access to operate the control panel, to fill the hopper and supervise the feed pump and mixer.
In front of the control panel and in front of the feed pump there must be at least 700 mm and also 700 mm on borth sides in order to leave enough room for the operator for refilling and cleaning the machine.
When inspecting the machine or performing main-tenance, etc. there must be access to the machine from the backside, where there is a service lid.
The fitter decides how much room there ought to be on this side of the machine.

PLEASE NOTE!
THE AREA AROUND THE MACHINE MUST ALWAYS BE SECURE.
NEVER LEAVE OBJECTS IN THE PASSAGES OR IN OPERATING POSITIONS WHICH MIGHT DISTURB THE DAILY OPERATION.



Working area

Fig. 3 – Installation

The IF 2000 is connected to the power supply and the working positions and the safety of the operators must be considered, when placing the wire system.
The wire must be secured to prevent persons from tripping over it or the wire from being damaged when operating the machine.
The IF 2000 must be placed between the freezer and the filler with regard to the pipe system and must be placed as close to the filler as possible.

PLEASE NOTE!
NEVER CONNECT THE MACHINE TO A POWER SUPPLY, WHERE A HPFI-RELAY IS INSTALLED, AS THE FREQUENCY CONVERTERS WILL CAUSE THE RELAY TO FALL-OUT.

PLEASE NOTE!
THE POWER SUPPLY MUST BE CONNECTED BY AUTHORIZED PERSONNEL.
THE ELECTRIC BOX CONTAINS CURRENCY-CARRYING PARTS AND IS ONLY TO BE OPENED BY AUTHORIZED PERSONS FOR PERFORMING SERVICE. ALWAYS REMEMBER TO DISCONNECT THE POWER SUPPLY BY MEANS OF THE MAIN SWITCH.
DURING OPERATION ACCESS TO THE ELECTRIC BOX SHOULD ALWAYS BE HINDERED BY CLOSING AND LOCKING THE LID. THE LID MUST BE PROPERLY CLOSED TO PREVENT WIRES FROM BEING JAMMED, WHICH MIGHT LEAD TO SHORT CIRCUITS AND ENDAGER THE OPERATOR.
THE MAIN CURRENT MUST BE SWITCHED OFF BY MEANS OF THE MAIN SWITCH BEFORE PERFORMING ANY OPERATIONS ON THE MACHINE.

The below illustration shows a IF 2000 coupled with a GRAM EQUIPMENT ice cream freezer, model GIF.

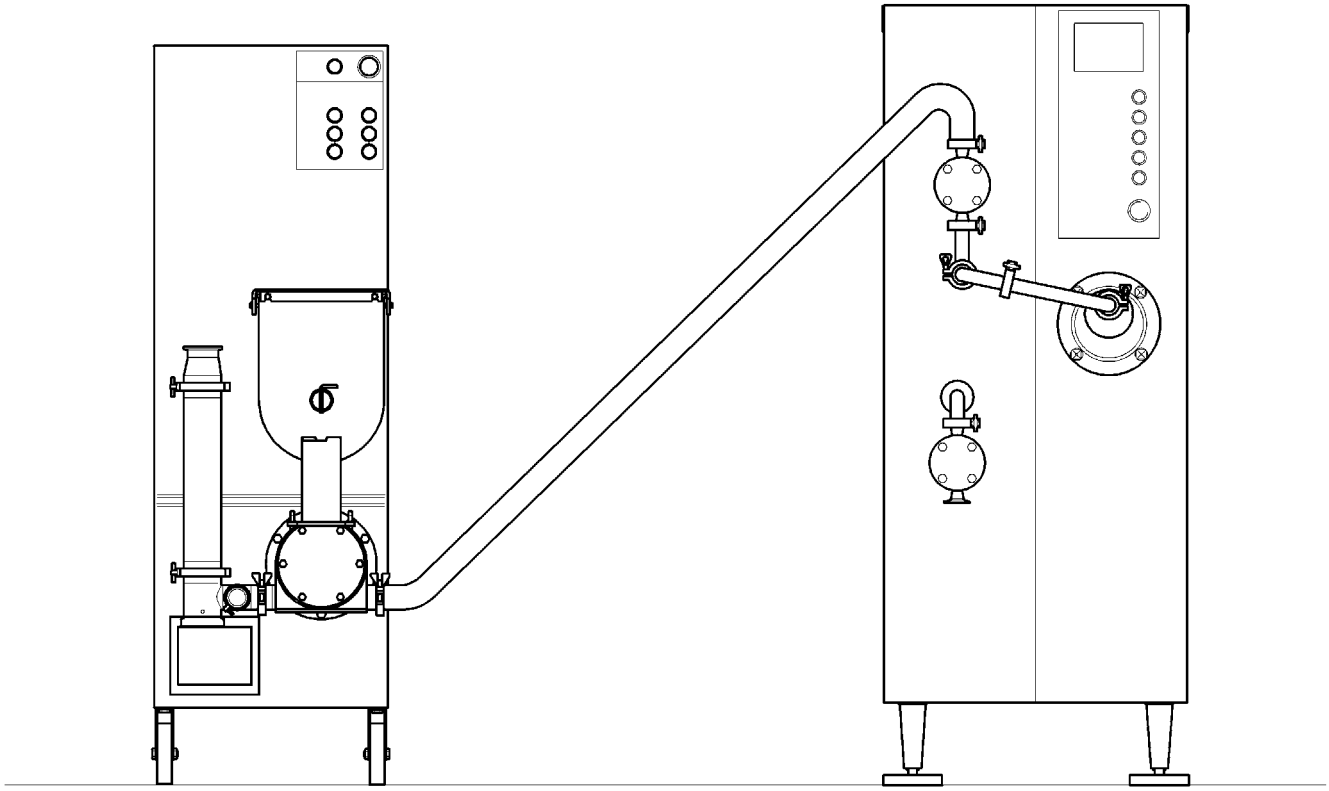


Fig. 4 – Installation

4.5 PREDISPOSITION

4.5.1 VERIFICATIONS MECHANICAL PREDISPOSITIONS

The mass in march of the Machine must be precedes from the following verifications and predisposition's:

a) Control of the tension of the chains of the unity of transport.

4.5.2 ELECTRIC CHECKS AND PRE-SETTING

Before starting the machine, it is necessary to carry out the following electric checks and pre-setting:

a) Check whether all bulbs of various warning or safety lights light-up.
b) Check the correct operation of all thermal probes.
c) Check the correct operation of safety pressostat on compressed air supply line.
d) Check the correct operation of various thermoregulators. To this aim, enable the warming means and let the thermoregulators to intervene. Set the desired temperature on the thermoregulators.
e) Check the correct operation of various emergency buttons or microswitches. Manually trigger the various emergency devices one after the other and verify whether the machine enters into an emergency condition as indicated on the relative paragraph.
f) Check whether the machine enters into an emergency condition in case of power supply shut off. To this aim, simulate a lack of voltage by opening a switch on the supply line upstream the switchboard and watch whether the machine enters into an emergency condition, as indicated on the relative paragraph.

5. START-UP AND ADJUSTMENT

The IF 2000 is tested and a trial run has been made before the machine leaves GRAM EQUIPMENT. Therefore the machine is ready for being put into service after it has been connected to the power supply.
However it must be controlled that the motors are operated in the correct direction before the machine is started and after possible repairs. Therefore the directions of rotation of the different motors will be described in the following.
The IF 2000 is constructed for maximal 3 motors, which are operating respectively:

1. The feed pump;
2. The auger/shaker;
3. The mech. after mixer.

5.1 THE FEED PUMP

The scrapers of the feed pump are to be operated clockwise, seen from the front into the feed pump.

PLEASE NOTE!
NEVER OPERATE THE FEED PUMP IN THE WRONG DIRECTION IF THE SCRAPERS ARE MOUNTED IN THE FEED PUMP, AS THIS WOULD DAMAGE THE SCRA-PERS. REMOVE THE SCRAPERS BEFORE THE FEED PUMP IS STARTED IF IT IS DOUBTFULL WHETHER THE DIRECTION OF ROTATION IS CORRECT.

The arrow on below illustration shows the correct direction of rotation of the feed pump.

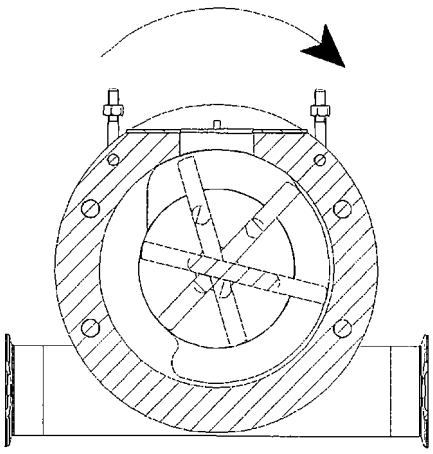


Fig. 1 – Feed pump

5.2 THE AFTER MIXER

The direction of rotation of the mixer must be counter-clockwise, seen from above into the mixer.
The arrow on below illustration shows the correct direction of rotation of the mixer shaft.

PLEASE NOTE!
THE ELECTRIC BOX CONTAINS CURRENCY-CARRYING PARTS AND IS ONLY TO BE OPENED BY AUTHORIZED PERSONS FOR PERFORMING SERVICE. ALWAYS REMEMEBER TO DISCONNECT THE POWER SUPPLY BY MEANS OF THE MAIN SWITCH.
DURING OPERATION ACCESS TO THE ELECTRIC BOX SHOULD ALWAYS BE HINDERED BY CLOSING AND LOCKING THE LID AND THE SERVICE LIDS OF THE NFD MUST BE MOUNTED.
THE LID MUST BE PROPERLY CLOSED TO PREVENT WIRES FROM BEING JAMMED, WHICH MIGHT LEAD TO SHORT CIRCUITS AND ENDAGER THE OPERATOR.

PLEASE NOTE!
NEVER REMOVE THE CONNECTION OF THE WIRES FROM THE TERMINAL BOXES OF THE MOTORS, BECAUSE THEY ARE CORRECTLY CONNECTED.
CONTACT GRAM EQUIPMENT IF THE UNITS ARE OPERATED IN THE WRONG DIRECTION.

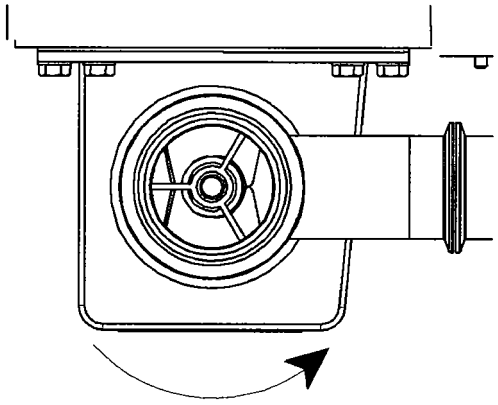


Fig. 2 – The after mixer

5.3 THE AUGER AND SHAKER

On the backside of the IF 2000 the belt drive of the auger and the shaker can be seen after the upper service lid has been dismounted.
The direction of revolution can be seen as well.
The shaker and the auger must be operated counterclockwise, seen from the back of the IF 2000 and into the box, where the belt drive is placed.
The illustration below shows the direction of revolution of the AC-gear motor, after removing the service lid on the back.

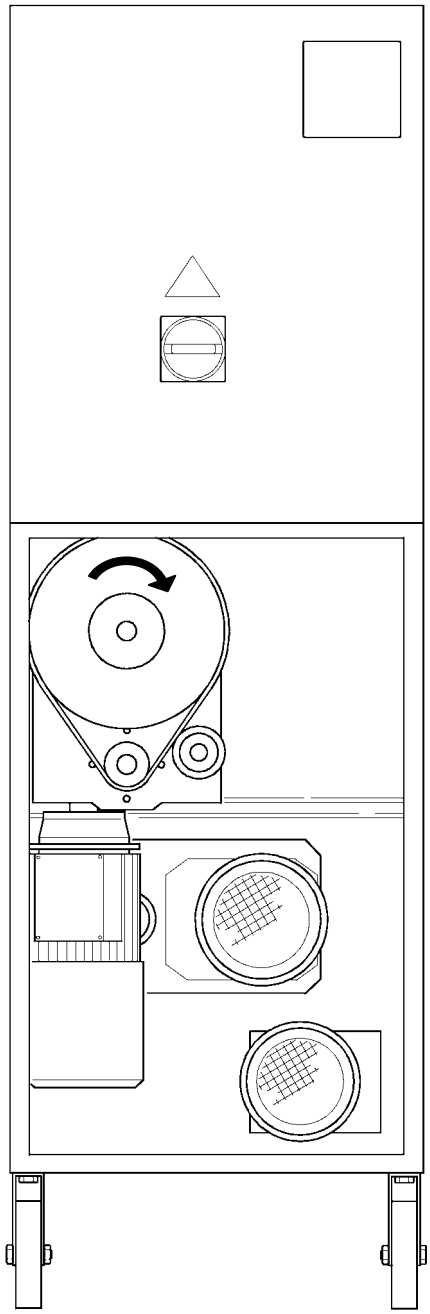


Fig. 3 – The auger and shaker

5.4 PLACING THE SHAKER

The lid must be open and the safety grate removed.
Tilt the shaker (Fig. 4 pos. 2) a little with the front down (the upper site of where the ring on the shaft is) and put it into the hopper.
Then stick the front through the hole in the front (Fig. 4 pos. 1) and the back over the drive shaft (Fig. 4 pos. 2), mounted on the inner backside of the hopper (Fig. 4 pos. 5).
Turn it until it can be pushed completely over the shaft. Insert the bearing (Fig. 4 pos. 3) and lock it with the pin (Fig. 4 pos. 4).
Make sure the safety grate is screwed on properly again.

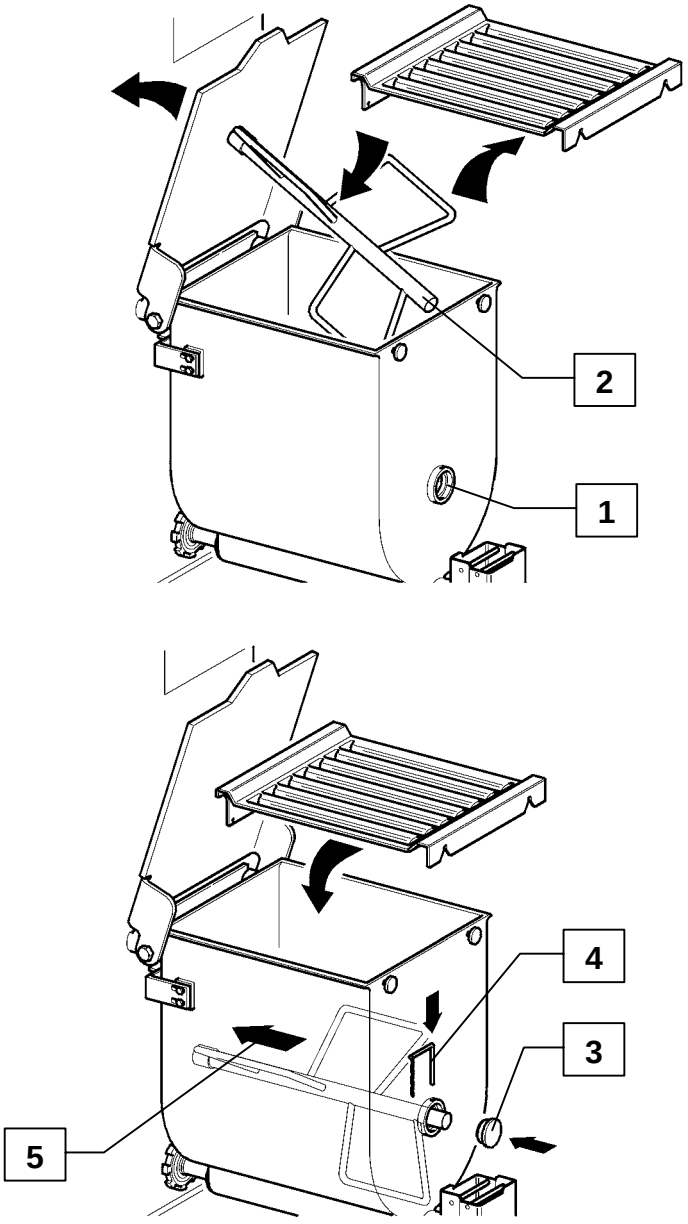
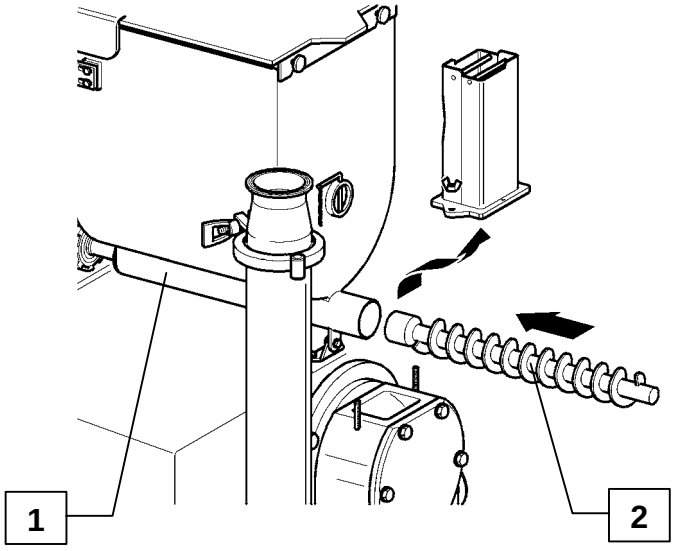


Fig. 4 – Placing the shaker

5.5 PLACING THE AUGER

The inlet funnel must be removed.
Put the auger (Fig. 5 pos. 2) through the pipe, with the “big” end first (Fig. 5 pos. 1) and place it over the drive shaft, mounted on the inner backside of the hopper. Turn it until it can be pushed completely over the shaft.
Mount the inlet funnel (Fig. 5 pos. 4) on the top of the feed pump (Fig. 5 pos. 3) and tighten the wing nuts (Fig. 5 pos. 5).



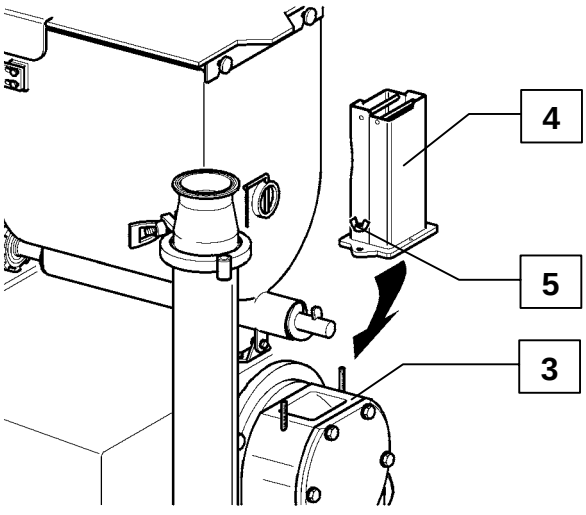


Fig. 5 – Placing the auger

6. ATTENTION AND GENERAL INSTRUCTIONS OF CLEANING

6.1 GENERALLY

PLEASE NOTE!
ALWAYS KEEP THE AREA AROUND THE MACHINE SECURE.
NEVER LEAVE OBJECTS IN THE PASSAGES AND THE OPERATING POSITIONS. THE OPERATORS MUST BE ABLE TO WORK SAFELY IN THE MENTIONED OPERA-TING POSITIONS.

Non-skid footwear is recommended and the floor should be clean and without spilt ice cream or flavouring, which could make the floor dangerous to walk on.

DANGER!
NEVER USE POISONOUS AND/OR INFLAMMABLE CLEANING AGENTS WHEN CLEANING THE MACHINE.

The machine is rinsed with water and possibly was-hed with a soft brush in order to remove residues of flavouring, ice cream and the like from the surface of the machine.

DANGER!
MANUAL CLEANING OF THE MACHINE AND ITS INTERNAL PARTS IS ONLY TO BE PERFORMED WHEN THE CONTROL VOLTAGE IS SWITCHED TO OFF.

PLEASE NOTE!
NEVER FLUSH DIRECTLY ON FAN GRATES, ELECTRIC BOXES, CONTROL UNITS, MOTORS OR OTHER SENSI-TIVE AND/OR CURRENCY-CARRYING COMPONENTS.

6.2 SAFETY DURING CLEANING

Always switch off the main current for the machine IF 2000 during cleaning of the machine, as the rotary parts will be touched during the daily cleaning. Dangerous situations are at risk in case the machine is started suddenly during the daily cleaning.

PLEASE NOTE!
ALWAYS SWITCH OFF THE MAIN CURRENT WHEN CLEANING THE MACHINE MANUALLY OR INSPEC-TING THE MACHINE.

During the CIP cleaning of the nest of tubes, make certain that the whole nest of tubes is properly mounted and tight before the CIP cleaning is started.

PLEASE NOTE!
DURING OR IMMEDIATELY AFTER THE CIP CLEANING THE TUBE CONNECTIONS, FEED PUMPS AND MIXER MIGHT BE HOT. DO NOT TOUCH THESE ELEMENTS, AS THERE MIGHT BE A RISK OF GETTING BURNED.

Ensure that there is not any cleaning agent left in the tubes after the CIP cleaning, because persons might get injured when disconnecting the tubes later.
When disconnecting certain parts of the machine during cleaning, please remember that some parts can be very heavy. For example the cover for the feed pump weighs $\leq$ 15 kg and should be handled very careful. If the cover is dropped it might injury e.g. toes.
The surface of the machine can be very slippery during cleaning. Never stand on the machine, e.g. when cleaning the hopper.

6.2.1 AFTER MIXER

The after mixer is sufficiently cleaned when the nest of tubes is flushed with cleaning fluid after the daily production or after the CIP cleaning.
The after mixer must in this case be operated to secure the best possible cleaning of the shaft.
See below illustration of the mechanical after mixer.
The shaft of the after mixer can be taken out of the after mixer pipe to be manually controlled or in case some parts inside the after mixer are to be manually cleaned.
This is done, by dismounting the upper clamp ring on the after mixer.
After this the upper piece of pipe is removed and the mixer shaft is easily taken out without any problems.
For inspection of the seal ring, the mixer pipe can easily be removed by dismounting the lower clamp ring.

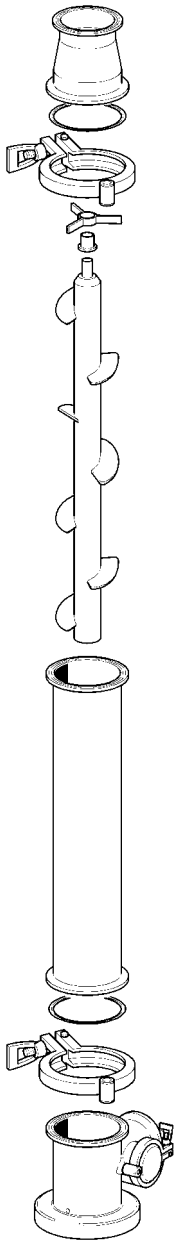
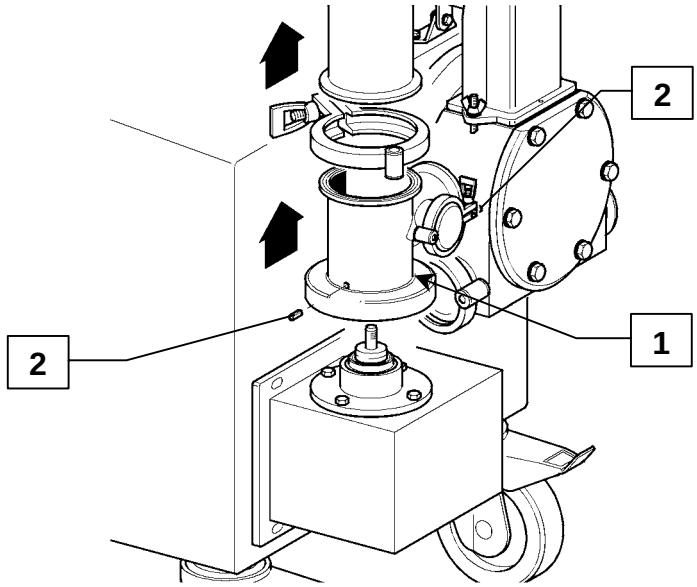


Fig. 1 – After mixer

If ice cream or cleaning water should come out of the outlet hole (Fig. 2 pos. 1), is this an indication of that the shaft seal is worn or broken.
Replace the seal with a new one and clean the inner parts. In this case, the top of the after mixer console must be disassembled.
Loosen the Tri-clamps and remove the after mixer tube. Hereafter loosen the small screws (Fig. 2 pos. 2) on both sides, lift and remove the lower part of the mixer.
If it is too difficult to pull-up, loosen the screws on the mixer bracket and pull the bracket a little away from the feed pump.
To prevent ice cream/cleaning solution to damage the gear motor, there is an extra seal ring (Fig. 2 pos. 3) on the lower part of the console.
The seal should be controlled, during cleaning, for wearness or damages and in such case be replaced.
Remove the spring-washer (Fig. 2 pos. 4) and shaft (Fig. 2 pos. 5) before controlling/replacing the seal ring.
After cleaned/replacing of seals, assemble every part in the reverse order as disassembled.
To make the assembly easier, don't tighten the mixer bracket until the lower part of the mixer has been fixed with both the screws and the triclamp on the feed pump.



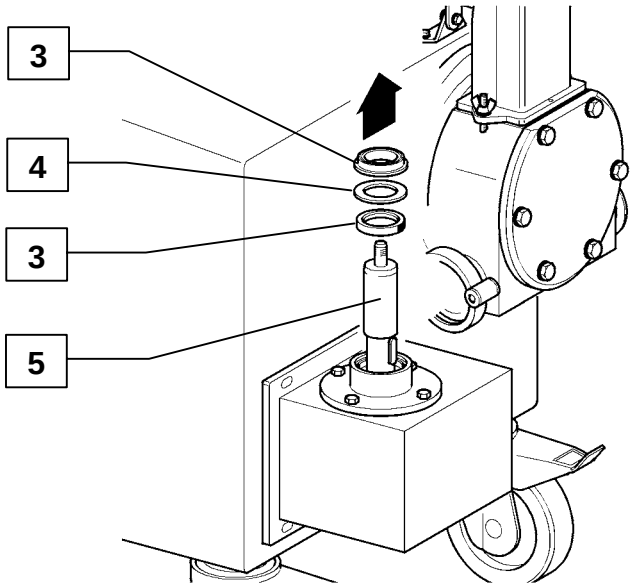


Fig. 2 – After mixer

6.2.2 THE FEED PUMP

Before the system is flushed with a cleaning agent or a CIP cleaning process, some preparations must be made on the feed pump:

1) Remove the inlet funnel;
2) Place the CIP-cover;
3) Open the front cover and switch off the 3 scrapers;
4) Reassemble the front cover.

PLEASE NOTE!
ONLY THE TOOLS DELIVERED FOR THE MACHINE ARE TO BE USED FOR DISASSEMBLING THE INNER PARTS OF THE FEED PUMP WHEN CONTROLLING OR CLEANING THE PUMP MANUALLY.

POINT 1

The connection between the hopper and the feed pump (Fig. 3 pos. 1) is removed during the CIP cleaning process to secure that the CIP liquid is shut off and make sure that the flavouring and other particles are not falling into the feed pump and into the CIP liquid (Fig. 3 pos. 2). Another advantage is the fact that the machine can be washed and flushed on the outside during the CIP cleaning without having to prevent particles from falling into the feed pump.

The connection between the hopper and the feed pump (Fig. 3 pos. 3) is removed bu dismounting the inlet pipe between the hopper and the feed pump (Fig. 3 pos. 1).

POINT 2

Then the delivered CIP-cover (Fig. 3 pos. 2) is mounted on the open inlet of the feed pump (Fig. 3 pos. 3), to secure that the CIP liquid is shut off and to shut off the feed pump thus dirt and particles do not get into the feed pump when cleaning other parts of the machine.

Below illustration shows how to do!

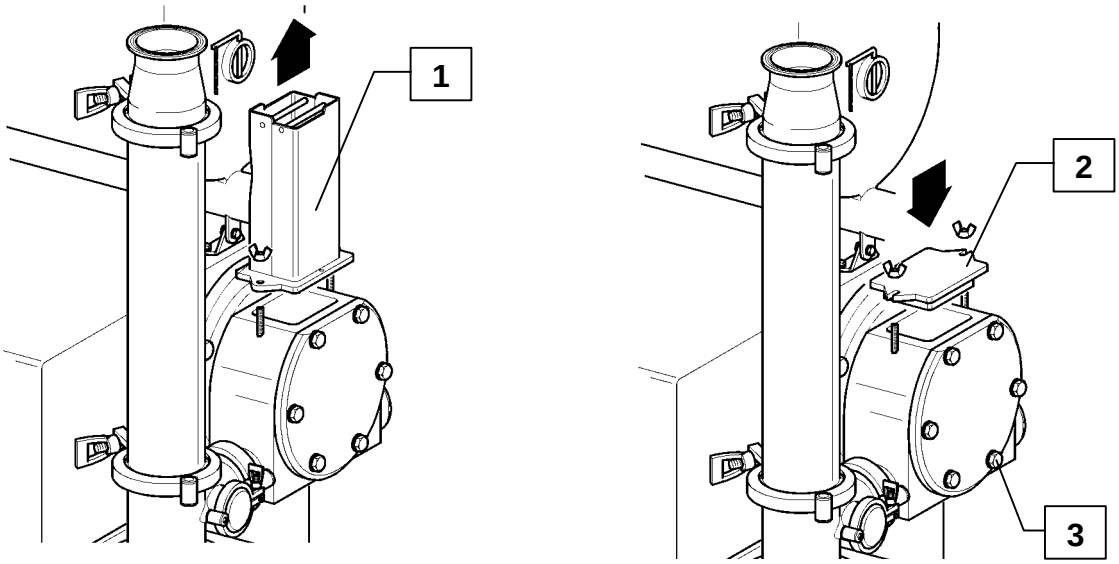


Fig. 3 – Feed pump

POINT 3

Remove the front cover and take the 3 scrapers off (Fig. 4 pos. A)
To avoid that the expansion caused by hot water washing blocks the pump.

POINT 4

Reassemble the front cover.

PLEASE NOTE!
DURING THE CIP CYCLE THE SUPPLY PUMP MUST NOT WORK IF THE THREE SCRAPER ARE NOT REMOVED BEFORE.

6.2.3 MANUAL CLEANING OF THE FEED PUMP

We recommend that the scrapers and the rotor of the feed pump are manually cleaned after the pipe system has been cleaned by flushing the system with the cleaning fluid, as this is the best cleaning method for the inner parts of the feed pump.
The cover of the feed pump is dismounted by unscrewing the six screws in the cover, after which the front cover easily is pulled out, by means of the enclosed pullout screws.
Then the scrapers of the feed pump can be taken out one by one, by means of the pullout tool and finally the rotor is pulled out, by means of the tool.
Be very careful not to damage the edges when mounting or dismounting the scrapers.
When the rotor and the scrapers have been pulled out, the inside of the feed pump housing can be cleaned and washed and the scrapers and rotor washed.
After pulling out the rotor, the hole should be covered to protect the gearbox and bearing during cleaning.
When mounting the rotor in the housing, be ware, not to damage the variseal (lip sealing ring), which is placed in the back of the housing.
Therefore use lots of grease (approved for use in the food industry), which will make the mounting easier.

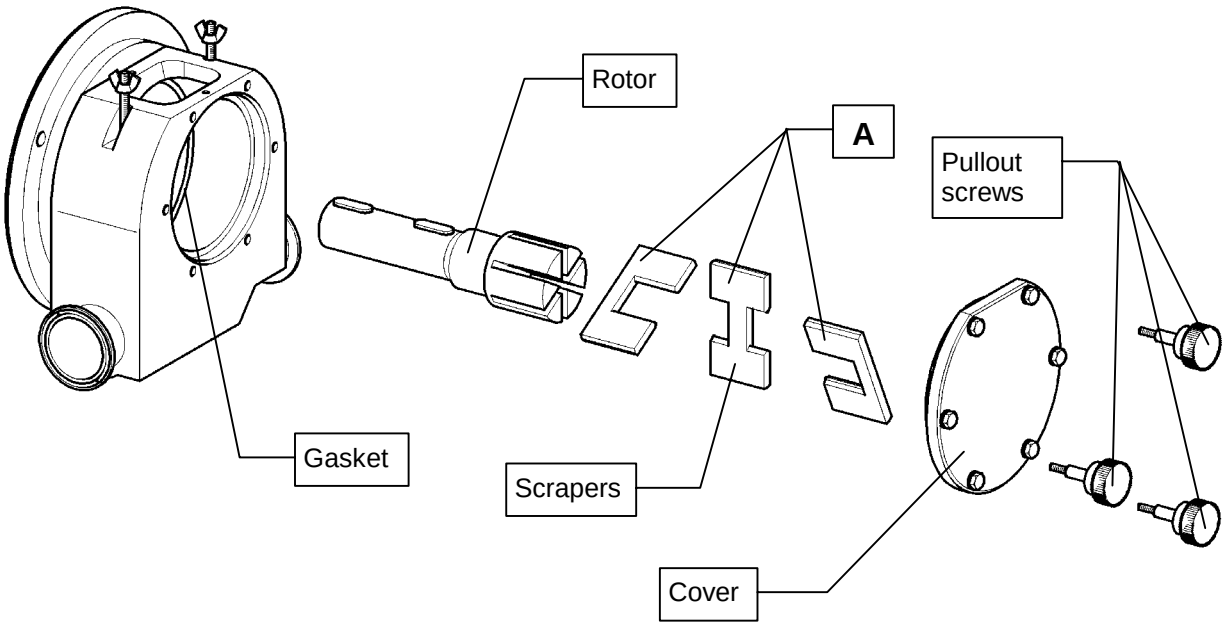


Fig. 4 – Manual cleaning of the feed pump

6.2.4 CLEANING THE HOPPER

It is easier to clean the hopper when the auger and shaker are dismounted thus water and cleaning agent can float out of the hopper during cleaning. Furthermore it is important to close the inlet of the feed pump with the delivered CIP cover for the IF 2000.

When cleaning the hopper, the auger and shaker must be taken out in the reversed order than they where put in.

The hopper will hereafter be ready for cleaning.

There is a risk of being injured when getting certain cleaning agents in concentrated form on the skin.

Everybody working with cleaning agents must be completely familiar with the cleaning procedures given by the supplier of the cleaning agent in question.

Furthermore we recommend that everybody is thoroughly conversant with first aid as well as the local first aid facilities, their placing, presentation and mode of operation.

PLEASE NOTE!
THE OPERATORS MIGHT ENDANGER THEMSELVES WHEN OPERATING OR TREATING THE MACHINE WIT-HOUT CARE. ALWAYS MAKE CERTAIN THAT THE MACHINES ARE IN A SAFE CONDITION. IN CASE OF DEFECTS OR MALFUNCTIONS, WHICH MIGHT ENDANGER THE OPERATORS, THE MACHINE MUST BE TAKEN OUT OF SERVICE IMMEDIATELY. THE DEFECTS MUST BE REPAIRED BEFORE THE MACHINE IS BROUGHT INTO OPERATION AGAIN.

Recommended Cleaning of the Ingredient Feeder machines.

CLEANING AGENTS

As cleaning agents and disinfectants for the CIP cleaning we recommend the following Henkel-Eco-lab products:

ALKALINE CLEANING

P3-mip LF 1-2%/60-70°C/15 min.

DISINFECTION

P3-triquart 0.2%/ cold

PRE-FLUSHING

After production stop the ice cream pipes are flus-hed with cold water while the shaker is operated. In order not to expose the different parts to wear, the system is only flushed until the water is clean. It is possible to re-cycle most of the mix in the pipe system by leading it back to the mix tank. Naturally it is necessary to control that the mix is not thinned by means of the pre-flushing water.

CIP-CLEANING (ALKALINE)

After the pre-flushing has been terminated, the CIP plant is connected and the machine is to be prepared for CIP-cleaning.

Then the system is pre-flushed with hot water at max. 50° C for approx. 10 min. The feed pump is not to be rotated while the system is flushed with hot water.

Then the CIP-cleaning is to be started:

Flush with alkaline cleaning agent e.g. HENKEL-ECOLAB "P3-mip LF" in a 1-2% solution, max. 60-70° C for approx. 15 min.

Afterwards the system is flushed with cold water.

STERILIZATION

Sterilize with hot water at max. 100° C for approx. 10 min., if necessary. **Never operate the feed pump during sterilization.**

DISINFECTION

Due to the risk of re-infection, the disinfectant is used immediately before the production is started.
The system is flushed with e.g. HENKEL-ECOLAB "P3-triquart" in a 0.2% solution at 10-15° C for approx. 10 min.
Pre-flushing with cold water, quality as drinking water.

PLEASE NOTE!
IF THE IF 2000 MACHINE IS NOT USED IMMEDIATELY AFTER THE CIP CLEANING, IT MUST BE RINSED CAREFULLY WITH PURE WATER TO REMOVE POSSIBLE PROCESS WATER.
THIS IS AFFECTED IN ORDER TO PREVENT THE INNER STAINLESS STEEL MATERIAL FROM BEING DAMAGED BY THE CIP WATER.
UNDER NO CIRCUMSTANCES USE CHLORINE-CON-TAINING CLEANING AGENTS OR PH-VALUES BELOW PH 7.
GRAM EQUIPMENT CANNOT BE HELD RESPONSIBLE FOR INCORRECT USE OF THE RECOMMENDED CLEANING AGENTS OR THE USE OF CLEANING AGENTS WITH OTHER PROPERTIES THAN MENTIONED ABOVE.

6.3 THE TOOTHED BELT DRIVE ON THE IF 2000

In order to secure a stable and optimum operation of the rotary parts of the machine, maintenance must be made on the toothed belt drive.
When performing maintenance work on the machine, the correct tightening of the toothed belts is to be controlled. Correct tightening of the toothed belts secures a stable and optimum operation of the machine and prolongs the life of the toothed belts.
The bearings and belt are additionally stressed if a toothed belt drive is tightened too much. This will reduce the life of the parts.
The belts might go off if the toothed belt drive is not tightened enough. This will lead to operational inter-ruptions.
Please notice that the belt will settle after the first hours of operation. Therefore it is important that the tightening of the belt is controlled in this period and the belt tightened, if necessary.

6.3.1 THE TOOTHED BELT DRIVE FOR THE AUGER/SHAKER

The toothed belt drive for the auger/shaker is illustrated below.
The toothed belt is tightened by means of a belt tension roller.
The belt tension roller is adjusted to press the belt until the correct tightening of the belt is achieved.notice that the belt will settle after the first.

DANGER!
ALWAYS DISCONNECT THE MAIN SUPPLY TO THE MACHINE WHILE THE TOOHTHED BELTS ARE CON-TROLLED AND, IF NECESSARY, ADJUSTED.

DANGER!
NEVER USE FORCE WHEN PLACING THE TOOTHED BELTS.

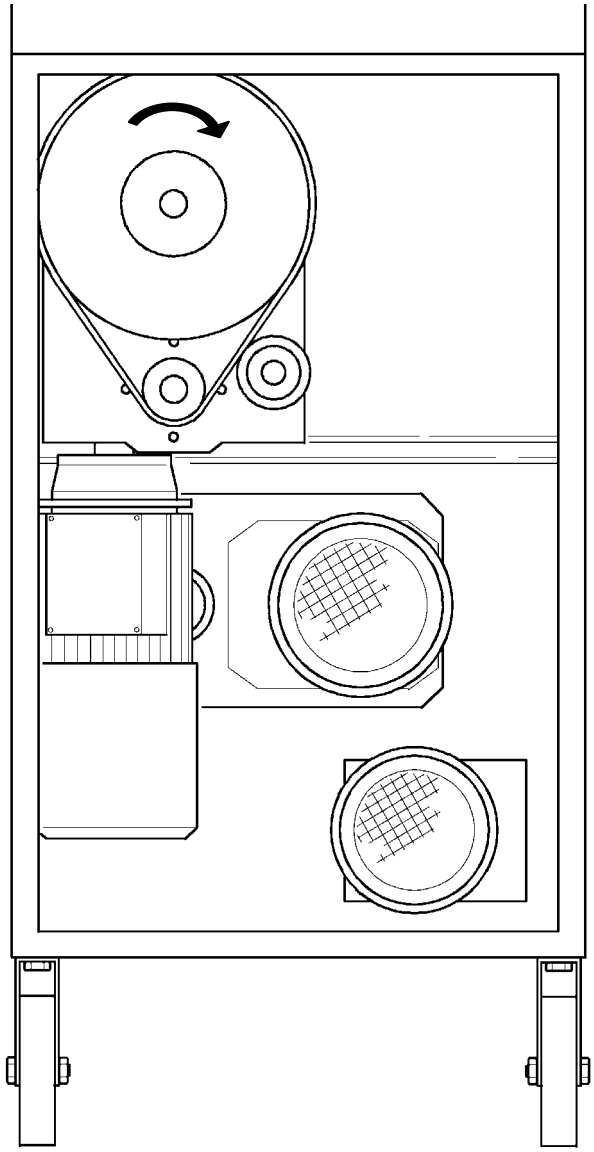


Fig. 5 – The toothed belt drive for the auger/shaker

7. MAINTENANCE AND LUBRICATION

7.1 RISKS AND SAFETY CONNECTED WITH THE OPERATIONS OF MAINTENANCE

The jobs of service, maintenance and reparation must be perform only from experienced personnel that knows well the operation and the problem list of the machine.
The same has to respect the norms and the prescriptions brought in the relative chapter and it has to be to knowledge of the content of the present manual and it has to remember well what the residual risks are brought in the relative chapter.

7.2 MAINTENANCE SCHEDULE

The machine has been conceived to reduce the maintenance work to the minimum.
The table below indicates such works.

NOTE: The indicated intervals must be considered as non compulsory suggestions, to be verified during exploitation according to the actual use condition of each installation.

7.3 LUBRICANTS

The lubricants to be used at the different points are included on the following table.

7.3.1 LUBRICANT PLAN

Lubricants used by GRAM EQUIPMENT — **Alternative lubricants**

LUBRICATE ORGAN	LUBRICATING ALUCHEM USDA H1	LUBRICATING AGIP	LUBRICATING SHELL
OIL LUBRICATION			
Bearings	ANDEROL 6320	BLASIA 320	OMALA 320
GREASY LUBRICATION			
General lubrication	PQ AA40/2	GR MU/EP	ALVANIA EP
SPRAY LUBRICATION			
Greasy general lubrication	ALUGRAF 782/S	/	/
Oil general lubrication	WHITE/S	/	/

WARNING:
The Firm GRAM EQUIPMENT employs atoxic products certified USDA H1.
The USDA H1 certification identifies those lubricants that due to their own characteristics can be used on machines and plants for the alimentary use.
The lubricants AGIP and SHEL are not USDA H1 CERTIFIED, the Firm GRAM EQUIPMENT declines any responsibility if those are used.

Following you will find the addresses and the commercial co-ordinator names in Europe as well as the retailers in Europe and the world:

The ANDEROL commercial manager in South Europe (France, Italy, Spain, Greece, Portugal, Turkey) is: Mr. L. Raynaud
5 l'Oliveraie - 13950 Cadolive - Francia
Tel./Fax: + 33 4 42 324637

The ANDEROL commercial manager in North Europe (Benelux, Norway, Sweden, Finland, Denmark, GB, Germany, Austria, Switzerland) is; Mr F. De Smet
Lorkenlaan 14 - 1820 Steenokkerzeel - Belgium
Tel./Fax: + 32 16 656203

7.4 RETAILERS

France:
ACHESON FRANCE S.A. - W. J.M. BachItarzi
ZA. Ouest, Rue Georges Besse - Boite Postal, 68 - 67152 Ersteín Cedex - France
Tel. +33 3 88 591023 - Telefax +33 3 88 590100 - Telex 891018f

North Germany (postal code 2, 30, 31, 32, 33, 38, 49, 49) CHEMIE MINERALIEN AG & Co- KG - Mr. J. Ludwíg
P.O. Box 106523 - 28065 Bremen. - Germany
Tel. +49 421 38786-0 - Telefax +49 4213967672

South Germany (postal code *7, 8)*
DGS Schaffner - Mr. G. Schaffner
BahnhofstraBe, 119 - 73430 Aalen - Germany
Tel. +49 736166001 - Telefax +49 736166146

Frankfort (postal code 6, 55)
RTS-TECHNIK - Mr. R. Schade
FriedlandstraBe, 23 - 63486 Bruchkobel - Germany
Tel. +49 6181976767168 - Telefax +49 6181976768169

Notdrhein Westfalen: *(*postal code 40, 41, 44, 45, 46, 47, SO, 51, 52, 53, 54, 56, 57, 58, 59)
VOSSMERBAUMER CHEMIE - Mr. U. Stahmann ScharnholzstraBe, 346 - D-46240 Bottrop – Germany Tel. +49 2041 7962-0 - Telefax +49 2041796230

England
ROBECO NAK Ltd- M. Worley
Ro1wey House, Dutton Lane - Eastleigh, Hampshire - SO50 6 AA England
Tel + 44 1703 629020 - Telefax + 44 1703 629115

North and South America/ Far East
ANDEROL Company
215 Merry Une - P. 0. Box 518 - E, Hanover, Nj 07936 - USA
Tel +201 884 3822 (Mr. M.Raab, Marketing Manager)
Tel +201884 3821 (Mr J. Meier, International Sales Manager) Telefax +201887 8404

Greece
"UNITEC" D. Margarìtís & Co. - Mr. D. Margaritis 10 Kairí & Sfakion Str. - 12131 Peristeri Attikis – Greece Tel. +30 (0)1 5752038 ~ Telefax +30 (0)1 5726002 – Telex 215457+

Italy
ALUCHEM Spa - Mr. H. Meyer Sr/Dr. A.Giacchero Via Abbiategrasso - 20080 Cisliano (MI) – Italy Tel + 39 2 90119979 - Telefax + 39 2 90119978

Norway
TRYKKLUFTSENTERET AS - Mrs. V. Heske
Kongeveien 49a - Postboks 95 - 1412 Sofiemyr – Norway Tel +47 66 804030 - Telefax +47 66 804055

Portugal
INDULUB LUBRIFICANTES - Mr. M. Liina
Apartado, 94 - Raso de Paredes - P-3750 Agueda – Portugal Tel +351 34 625811 - Telefax +35134 601401

Spain
COGELSA SA - Mr. J. Lopez Martì/ Mr. Brugarolas Conde C/Comercio, 36 - Poligono Industrial Can Sunyer 08740 Sant Andreu de la Barca (Barcellona) Spain
Tel +34 3 6822220 - Telefax +34 3 6820055

Sweden
UNIQ NORDISKA AB - Mr. C. Lindqvist
P.O. Box 137 - 43523 Molnlycke - Sweden
Tel +46 31886075 - Telefax +46 31 885650

Switzerland
BIOCchem (Aluchem Syìmra) - Mr. M. Gurrieri
0pfikonertrasse, 21 - 8304 Wallisellen, (ZH) – Switzerland
Tel +4118302803 - Telefax +4118302439

Turkey
SEKER TICARET - Mr. S. Zeki Seker
Tersane Caddesì - Arapcami Cizmaki no. 1 - 80000 Karakoy Istanbul - Turkey
Tel +90 212 255440312555774 - Telefax +90 212 2533256 – Telex 24683+

7.5 MAINTENANCE OF MOTORS AND GEAR

There is a number of gear and motors in the various drives of the IF 2000, which must be checked at regular intervals.
First te gear and motors placed in the respective drives on the machine are described and then there is a general description of the maintenance.
Generally all the units are lubricated for life and do not require any maintenance at all. However it is recommended that the gear which is a part of the drive of the feed pump, should be exchanged according to the mentioned intervals on the next column.

THE FEED PUMP DRIVE

AC-flat gearbox motor
Type: GFL 06-3M-HCR 071C32.
Motor: MDEMA1M 071C32
0.37 kW, 3×240/400V, 50 Hz

THE AUGER/SHAKER DRIVE

AC-helical bevel gearbox motor
Type: GKR03-2M HAR 071C32.
Motor: MDEMA1M 071C32
0.37 kW, 3×240/400V, 50 Hz

THE MIXER DRIVE

AC-helical bevel gearbox motor
Type: GKR03-2M HAR 071C32.
Motor: MDEMA1M 071C32
0.37 kW, 3×240/400V, 50 Hz

MAINTENANCE

The drives and motors for the IF machine are delivered ready for use. All the motors and gears on the IF are of the marke Siemens.
The drives are filled with the correct quantity of oil in accordance with the mounting procedure in question.
Regarding the flat gear, in the drive of the feed pump, oil is to be changed after approx. 16.000 hours of operation or after max. 3 years in order to achieve a long life for the machine.
The oil level should be checked every year and re-filled, if necessary.
The bevel gear is not to be serviced at all.

Flat gear GFL 06:
Oiltype: CLP 460
Quantity: 2,1 ltr.

Helical bevel gear GKR 03:
Oiltype: CLP 460
Quantity: 0,35 ltr.

For further information, please see the enclosed Siemens manual for the gearboxes.

7.6 INSPECTIONS OF THE IF 2000

Regular inspections of the IF 2000	Frequency
♦ Control the lip sealing rings and corresponding gaskets in the feed pump and mech. after-mixer. ♦ Control the lip sealing rings at the driving shafts for the auger and the shaker.	500 hours of operation
♦ Control the toothed belt drive and tighten it, if necessary. ♦ Control whether the scrapers of the feed pump are damaged.	1000 hours of operation
♦ Control the oil level in the flat-gear (16,000 hrs). ♦ Control whether there are play or worn parts in the bearings.	10000 hours of operation

Regular inspections of the IF 2000	Frequency
♦ Exchange the lip-sealing ring in the mech. After mixer. ♦ Exchange the lip-sealing rings for the auger and shaker. ♦ Exchange the o-ring in the feed pump cover.	500 hours of operation
♦ Exchange the toothed belt for the auger/shaker. ♦ Exchange the scrapers in the feed pump.	1000 hours of operation
♦ Exchange the bearings on the shaker shaft. ♦ Exchange the rotor in the feed pump.	25000 hours of operation

7.7 MAINTENANCE OF STAINLESS STEEL

7.7.1 CARE TO BE RESERVED TO STAINLESS STEEL

Stainless steel components of GRAM EQUIPMENT machines are manufactured, welded and assembled by expert workers by following manufacture processes that preserve stainless steel corrosion resistance qualities.
The preservation of these corrosion resistance qualities in production conditions requires a continuous care and the respect of the precautions listed below. (NOTE: corrosion resistance is higher when an oxide layer forms on stainless steel surface; if such a film is disturbed or destroyed, the stainless steel becomes activated and much less corrosion resistant).

1. Regularly check all electric devices in any way connected to the machine, in order to find out any possible stray current caused by pour grounding, damaged insulation or other defects.

Corrosion: Pitting corrosion many times shows-up when stray currents come into contact with wet stainless steel.

2. Never leave wet rags, various items, wrenches, etc. in contact with stainless steel.

Corrosion: Pitting and galvanic action. The items laying on stainless steel retard the complete drying, thus preventing the air to form the protecting film. A galvanic action takes place when two different and wet metals are in contact.

3. Resort to water purification when foreign substances that could generate staining or deposits are present into the supplied water.

Corrosion: Pitting, deposits, staining.
The deposits act against the best cleaning practices and cause corrosion also on stainless steel of the best quality.

4. Immediately rinse the equipment after use with warm water until the rinsing water is clear. Clean (by hand or CIP) the equipment as soon as possible after rinsing.

Corrosion: Staining, deposits, pitting. Product deposits several times cause pitting inside the particles.

5. Use just recommended cleaning products. Purchase all chemical products from esteemed and responsible manufacturers (that are familiar with stainless steel production equipment), that continuously check the effects of their products on stainless steel.
6. Use chemical products by respecting manufacturers' prescriptions. Do not exceed chemical product concentration, temperature and exposure times.

Corrosion: Pitting and staining. Stress cracks. A permanent damage arises from chemical product concentration, temperature and exposure times.

7. For manual cleaning, use just non metal brushes, sponges or soft pads. Brush along satining direction avoiding to scratch the surface.

Corrosion: Pitting, scratching. Metal brushes or rough sponges scratch the surface, thus favouring corrosion in the long time. The metal particles left on stainless steel surface generate its pitting.

8. Use chemical bactericides in the correct way as specified by their producers and by following the local authority prescriptions. Use minimum temperature, concentration and exposure time. Rinse immediately after treatment with chemical bactericide. In any case the solution must not remain in contact with the stainless steel for longer time than 20 minutes.

Corrosion: Destruction of protecting film. Chlorine and other halogen bactericides may destroy the protecting film. A small temperature increase greatly favours the chemical action and accelerates the corrosion.

9. Verify regularly the connection points to piping. Ensure that all connections are tight without bending or any sort of deformation.

Corrosion: Interstice corrosion. Small cracks generated by gaskets pourly fitted favour interstice corrosion. Stainless steel under stresses may generate cracks mainly in the presence of bactericides containing chlorine.

10. Regularly verify any possible surface corrosion on all equipment (i. e. pitting, deposits, stress cracks, etc.). If deposit or staining are noticed, remove them immediately by using light abrading powders and detergents. Rinse carefully and let dry in air. Review production and cleaning procedures to find out the cause.

NOTE: If the corrosion is not removed, the protecting film cannot be restored and corrosion will continue with growing speed.

7.8 TROUBLE SHOOTING ON THE TOOTHED BELT DRIVE

ERROR	POSSIBLE CAUSE	HOW TO SOLVE THE PROBLEMS
Unusual wear and tear on the belts		
- On the toothed flank	The belts are too light	Adjust the centre distance Adjust the belt tightening wheel
- On the underside of the tooth	Too much tension	Reduce the centre distance Adjust the belt tightening wheel
- On the belt flank	Wrong alignment Bended guide discs	Align the toothed belt wheel Align or exchange the guide discs
The belts are swelled	Influenced by grease, oil, etc.	Protect the drive against grease, oil, etc. Clean the discs before placing new belts
The belts are running off the disc	The toothed belt discs are not in line The toothed belt discs are not properly mounted	Align the toothed belt discs The toothed belt discs are properly mounted
Unusual wear and tear on the teeth of the belt	The belts are too tight	Reduce the centre distance Adjust the belt tightening wheel
Too high noise level	The toothed belt wheel is not in line The belt is tightened too much	Align the toothed belt wheel Reduce the centre distance Adjust the belt tightening wheel

7.9 TROUBLE SHOOTING ON THE FEED PUMP

ERROR	POSSIBLE CAUSE	HOW TO SOLVE THE PROBLEMS
The ice cream moves into the inlet of the feed pump	Worn scrapers	Exchange the scrapers
The ice cream comes out between the cover and the feed pump housing	Worn lip sealing ring The lip sealing ring is not properly mounted	Exchange the lip sealing ring The lip sealing ring is properly mounted
The scraper does not rotate	Error in the drive of the feed pump	Inspect the feed pump drive

7.10 TROUBLE SHOOTING ON THE MIXER

ERROR	POSSIBLE CAUSE	HOW TO SOLVE THE PROBLEMS
The shaft does not rotate	Error in the drive of the mixer	Examine the mixer drive
Ice cream is leaking out of the connections	The packings are not properly mounted The packings are worn	The packings are properly mounted Exchange the packings

7.11 TROUBLE SHOOTING ON THE OPERATION OF THE MACHINE

ERROR	POSSIBLE CAUSE	HOW TO SOLVE THE PROBLEMS
Flavouring is not added to the ice cream	The hopper is empty The inlet of the feed pump is blocked up The augers have stopped	Re-fill the hopper The inlet is cleaned See below
The shaker does not rotate	Error in the drive of the shaker The shaker is blocked	Control the drive of the shaker The blockage is removed
The auger does not rotate	Error in the drive of the auger The auger is blocked	Control the drive of the auger The auger is cleaned
The structure of the ice cream is not homogeneous as regards the supply of flavouring	The mixer does not work	See trouble shooting for the mixer

8. DISMANTLING

WARNING:
The equipment must of course be disconnected from electric, pneumatic and water sources before consignment to the personnel in charge of dismantling.

After having emptied and washed the plant thoroughly follow the instructions of relative chapter to lift and transport the plant.
All works must be accomplished by dismantling skilled personnel who must also be aware of related problems.
Do not spread into the environment washing and rinsing waters, rather send them to suited disposal treatment.
During dismantling, try to split the line into its main components and dismount every thing by pursuing different materials separation, as electrical wires, motors, reducers, frames, cast iron, and aluminium casting, plastic components, etc.
Reducing, oscillator and intermitted may contain residuals of lubricating oil that must be discharged and sent to the specific treatment before sending the parts to scrap.

9. STAFF TRAINING

All staff using the equipment (operators, fitters, line supervisors) or performing maintenance service (mechanical and electrical service engineers) must have undertaken a training session including the following:

- reading and comprehension of the present handbook.
- training on the job with GRAM EQUIPMENT staff that installed and operated the machine.

GRAM EQUIPMENT supplies, upon request, a sufficient training period to prepare the personnel on machine operation and main maintenance works.

10. SCHEMES AND SPARE PARTS

10.1 LIST OF SCHEMES

N. PROG.	CODE	DESCRIPTION	N. ATTACHED SHEETS
1	9.07.70.1000x06	ELECTRIC DIAGRAM	17

RATING POWER	1,3 KW	OPERATING RATING VOLTAGES	380–415 V
FREQUENCY NOMINAL	50–60 HZ	AUXILIARY CIRCUITS RATING VOLTAGES	24 VAC
RATING CURRENT	6 A	ORDER	
	DATE	SIGNATURE	
EXECUTOR	30–09–2004	GRITTINI PAOLO	

BOARD

+A1 — QUADRO PRINCIPALE / *MAIN BOARD*

+BM — BORDO MACCHINA / *BOARD MACHINE*

PROJECT

IF 2000

FRUIT FEEDER

400V

DRAW.N°

9.07.70.1000x06

	DRAW.N. 9.07.70.1000x06	PROJECT *IF 2000 400V*	EXECUTOR GRITTINI PAOLO	*Gram Equipment* *Ice cream the way you like it...* *C & G S.P.A.*	SHEET 1
	DATE 30–09–2004	DENOMINATION INTESTAZIONE / *HEADING*			TOT. 17 / NEXT 2
	ORDER				

LISTA FOGLI \ INDEX

Foglio Sheet	Descrizione Description	Revisione \ Revision 0	1	2	3	4	5	6	7	8	9
1	INTESTAZIONE / HEADING	X									
2	LEGENDA / ITEM DESIGNATION	X									
8	LAYOUT PIASTRA / LAYOUT MAIN BOARD	X									
9	LAYOUT PANNELLO / LAYOUT CONTROL PANEL	X									
10	ALIMENTAZIONE / INCOMING SUPPLY	X									
11	MOTORE POMPA / PUMP MOTOR	X									
12	MOTORE AGITATORE A VITE / AGITATOR SCREW MOTOR	X									
13	MOTORE USCITA MIXER / AFTER MIXER MOTOR	X									
14	CIRCUITO AUSILIARIO / AUXILIARY CIRCUIT	X									
15	CIRCUITO AUSILIARIO / AUXILIARY CIRCUIT	X									
16	CIRCUITO AUSILIARIO / AUXILIARY CIRCUIT	X									
17	INGRESSI PLC / PLC INPUT	X									
18	USCITE PLC / PLC OUT	X									
19	INGRESSI PLC / PLC INPUT	X									
20	USCITE PLC / PLC OUT	X									
21	LEGENDA / ITEM DESIGNATION	X									
22	LEGENDA / ITEM DESIGNATION	X									

Foglio Sheet	Descrizione Description	Revisione \ Revision 0	1	2	3	4	5	6	7	8	9

DRAW.N. 9.07.70.1000x06

DATE 30-09-2004

ORDER

PROJECT: IF 2000 400V

EXECUTOR: GRITTINI PAOLO

DENOMINATION: LEGENDA / ITEM DESIGNATION

Gram Equipment

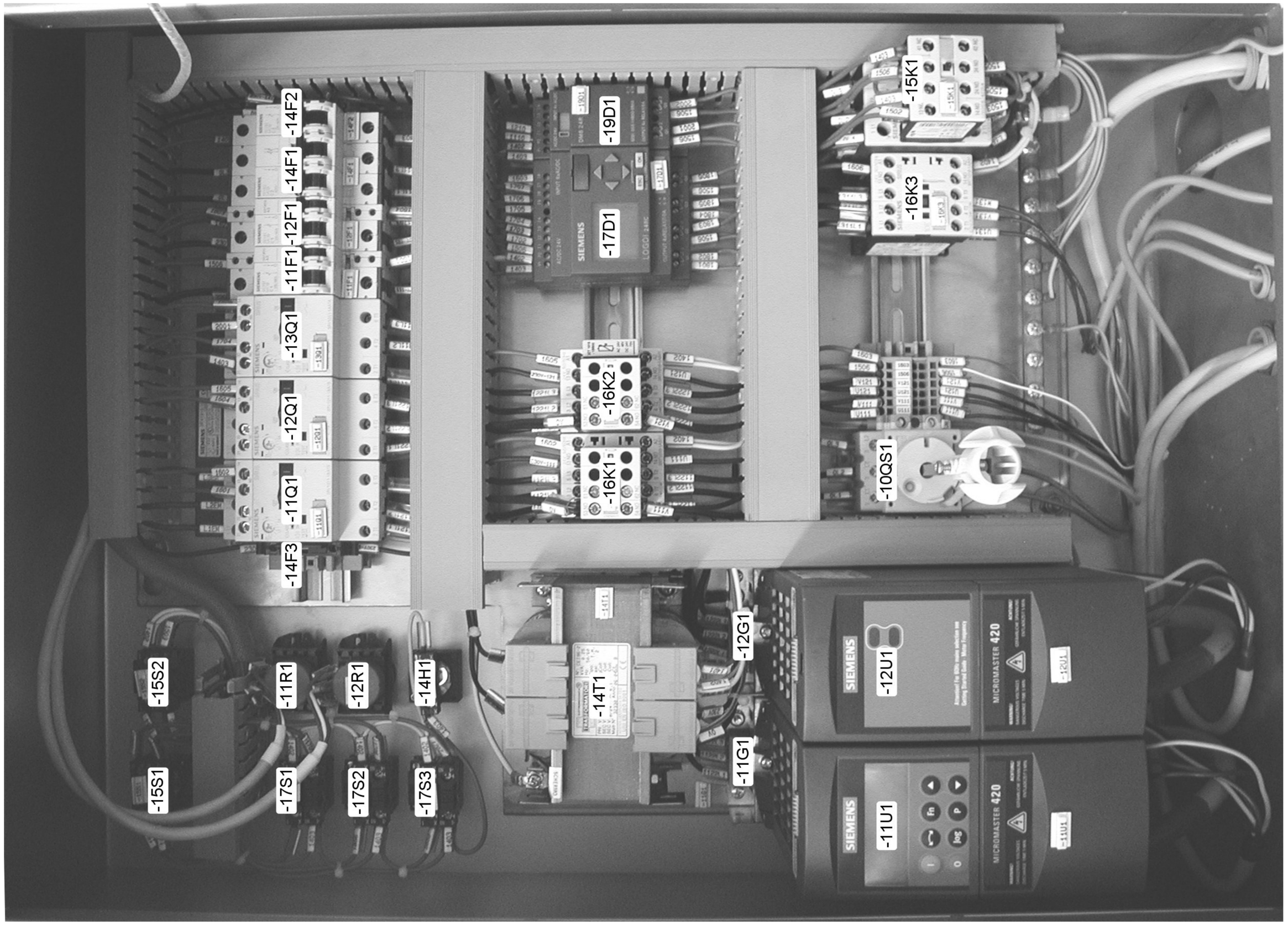
ice cream the way you like it...

C & G S.P.A.

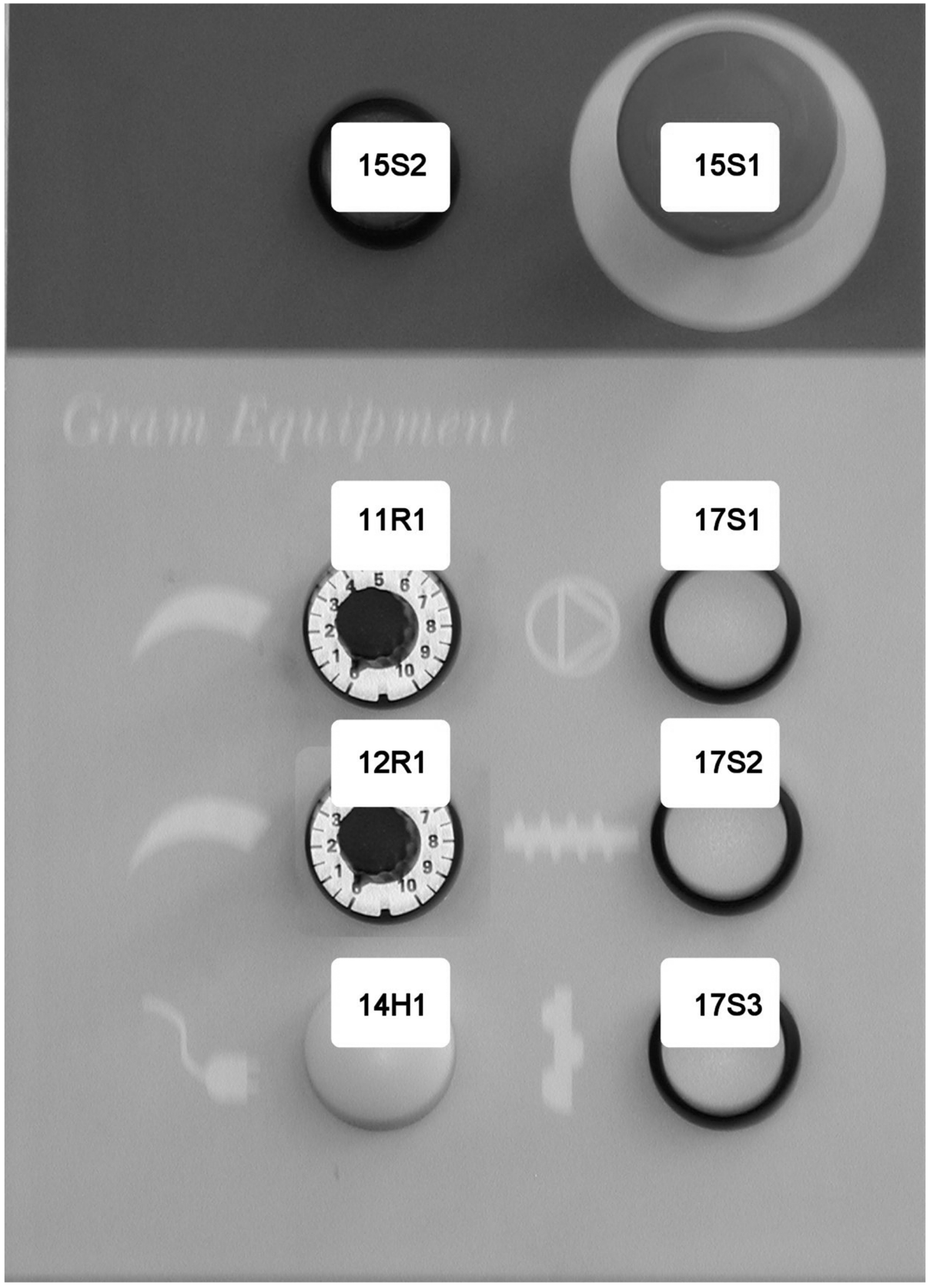
SHEET 2

TOT. 17

NEXT 8



	DRAW.N. 9.07.70.1000x06	PROJECT IF 2000 400V	EXECUTOR GRITTINI PAOLO	*Gram Equipment* ice cream the way you like it... *C & G S.P.A.*	SHEET 8
	DATE 30-09-2004	DENOMINATION LAYOUT PIASTRA / *LAYOUT MAIN BOARD*			TOT. 17 / NEXT 9
	ORDER				



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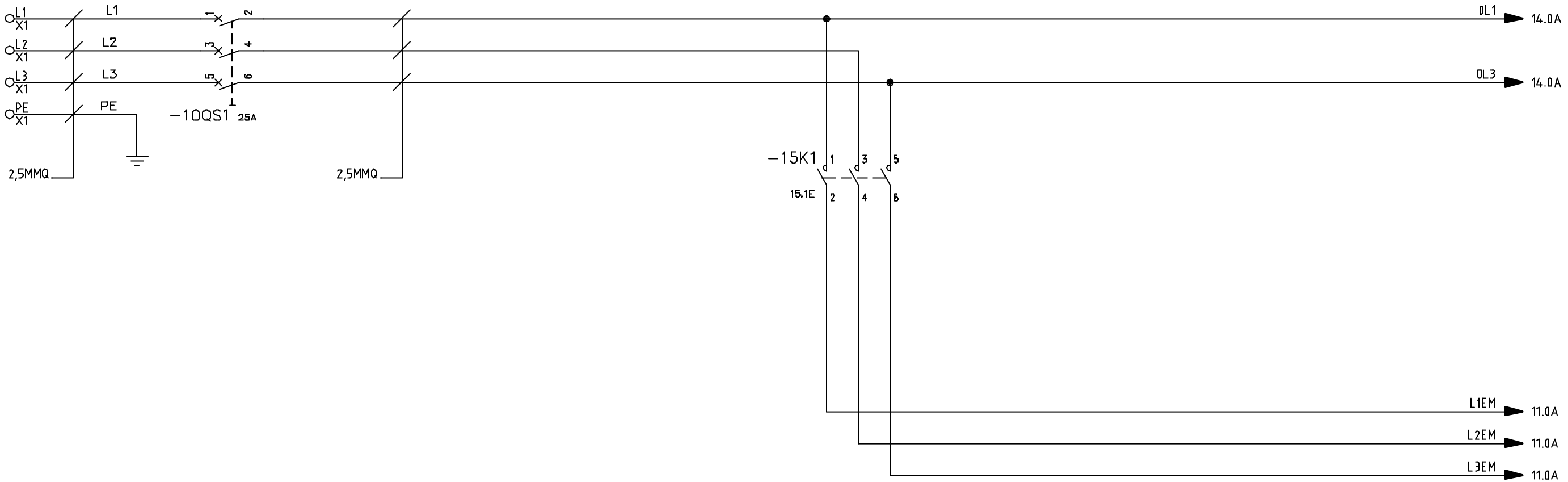
	DATE 30-09-2004	DENOMINATION LAYOUT PANNELLO / LAYOUT CONTROL PANEL			TOT. 17	NEXT 10
	ORDER					



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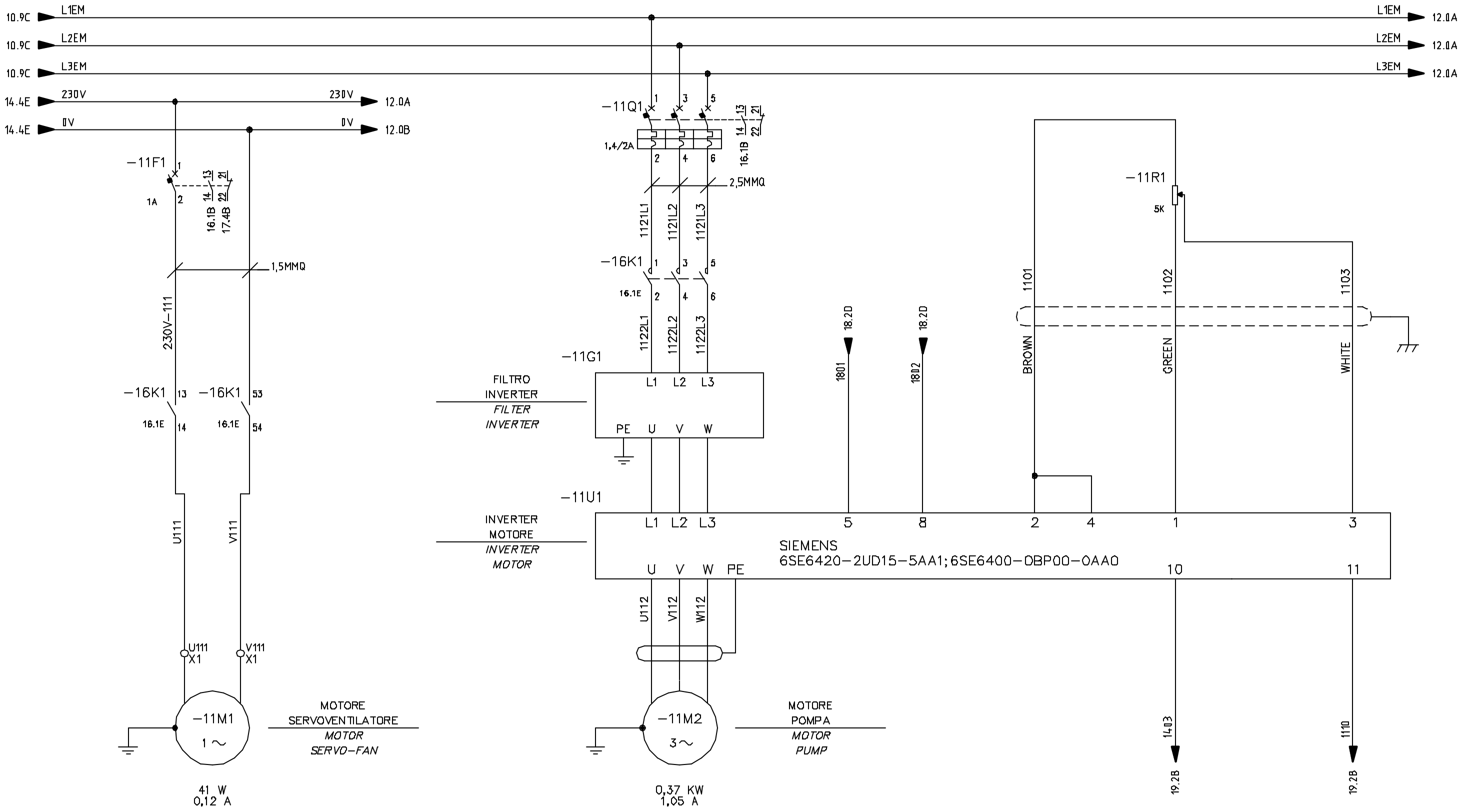
	DATE 30-09-2004	DENOMINATION ALIMENTAZIONE / INCOMING SUPPLY			TOT. 17 / NEXT 11
	ORDER				



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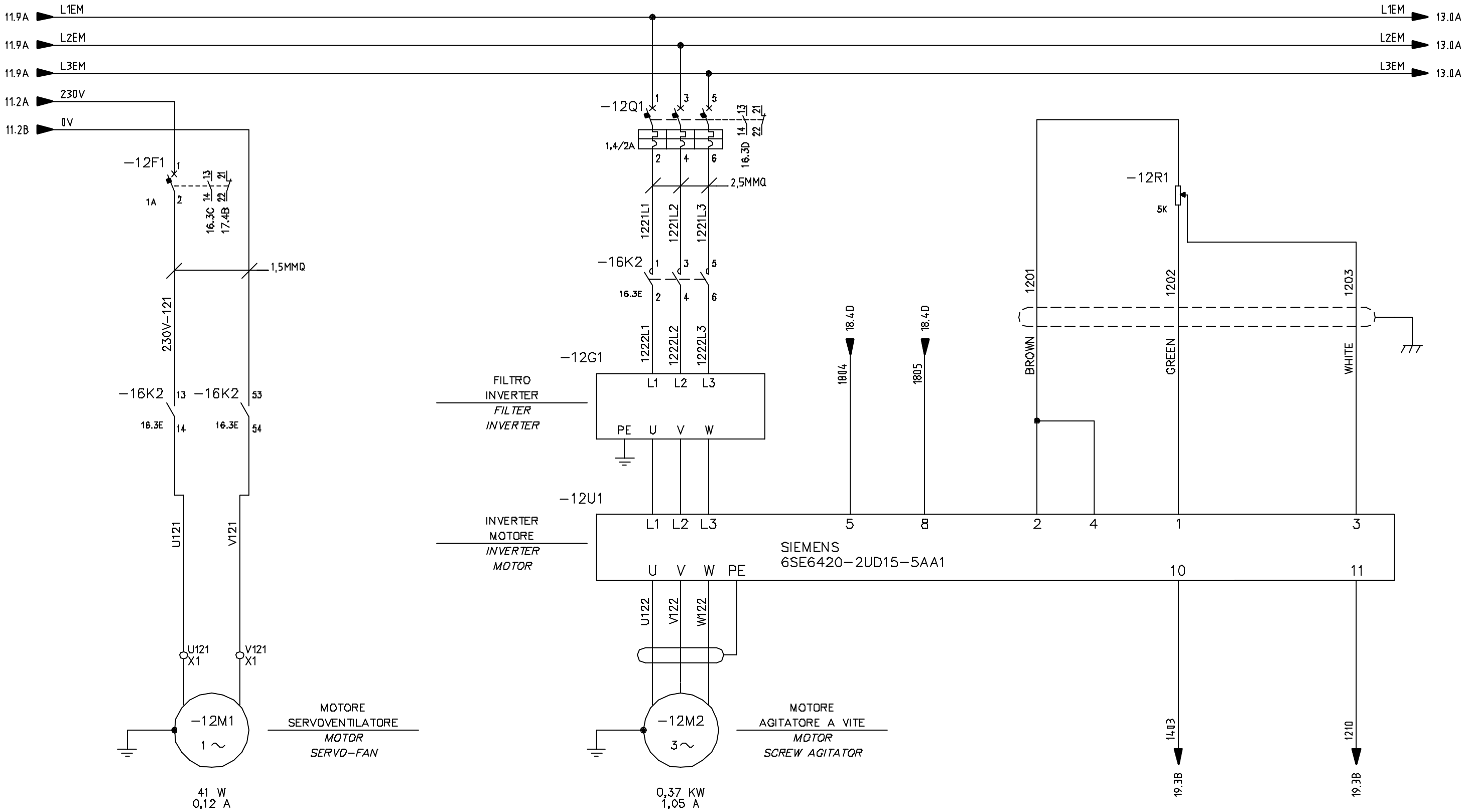
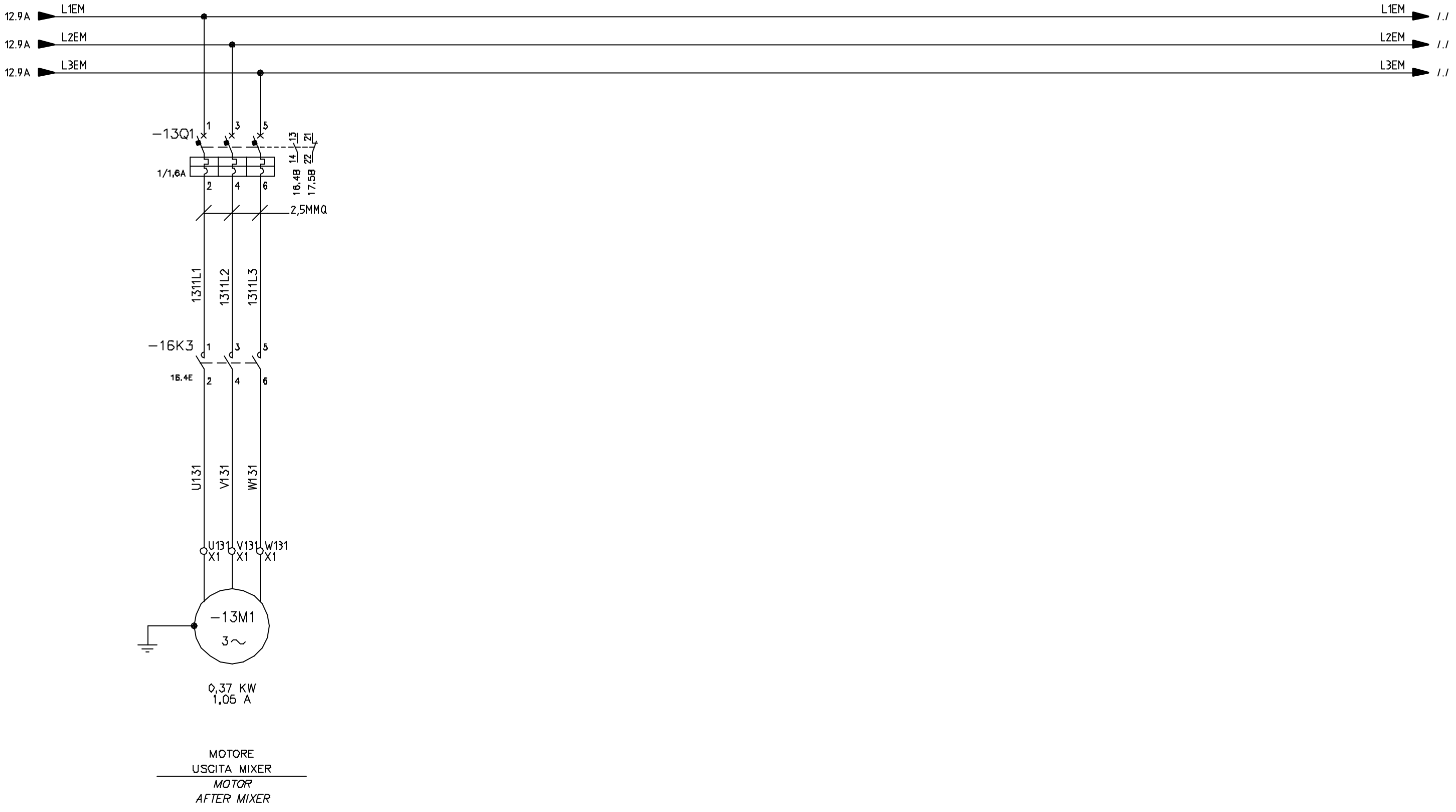
	DATE 30−09−2004	DENOMINATION MOTORE POMPA / PUMP MOTOR			TOT. 17 / NEXT 12
	ORDER				



	DRAW.N. 9.07.70.1000x06	PROJECT IF 2000 400V	EXECUTOR GRITTINI PAOLO	*Gram Equipment* ice cream the way you like it... C & G S.P.A.	SHEET 12
	DATE 30−09−2004	DENOMINATION MOTORE AGITATORE A VITE / AGITATOR SCREW MOTOR			TOT. 17 / NEXT 13
	ORDER				



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	DATE 30-09-2004	DENOMINATION MOTORE USCITA MIXER / AFTER MIXER MOTOR			TOT. 17 / NEXT 14
	ORDER				

VENTILATORE
QUADRO ELETTRICO
FAN
ELECTRIC PANEL

ALIMENTAZIONE
AUSILIARIA 24V
INCOMING SUPPLY
AUXILIARY 24V

SPIA
LINEA
PILOT LIGHT
POWER ON

10.9A QL1
10.9A QL3

−14F1 1 3
2A 2 4

1,5MMQ

1411L1
1411L3

380/415V

−14T1
230V 100VA
24V 150VA
250VA
230V
24V

−14F3 1
1A 2

230V-141
X1
230V-141

0V
X1

−14EV1
M
1AC

0V
11.0B

230V
11.0A

1401

−14F2 1
2A 2

1403 15.0A

−14H1 X1
WHITE X2

1402 15.0E

	DRAW.N. 9.07.70.1000x06	PROJECT IF 2000 400V	EXECUTOR GRITTINI PAOLO	*Gram Equipment* *Ice cream the way you like it...* *C & G S.P.A.*		SHEET 14
	DATE 30−09−2004	DENOMINATION CIRCUITO AUSILIARIO *AUXILIARY CIRCUIT*			TOT. 17	NEXT 15
	ORDER					

CIRCUITO EMERGENZA
CIRCUIT EMERGENCY

RIASSETTO EMERGENZA
RESET EMERGENCY

14.9A 1403 → 1403 17.0A

1506 16.0A

−15S1 11 21 12 22 15.1B

1501

−15S1 21 15.1B 22

1502

−15S2 13 14 X1 X2 15.2D

−15K1 13 14 15.1E

1503

1504

−15K1 A1 A2

−15S2 X1 15.1C BLUE X2

−15K1 41 15.1E 42

−15K1 23 33 15.1E 24 34

1505

14.9E 1402 → 1402 16.0E

10.5B 2 1
10.5B 4 3
10.5B 6 5

15.2C 14 13
15.3B 24 23
15.3B 34 33
15.2B 42 41

	DRAW.N. 9.07.70.1000x06	PROJECT *IF 2000 400V*	EXECUTOR GRITTINI PAOLO	*Gram Equipment* *ice cream the way you like it...* *C & G S.P.A.*	SHEET 15
	DATE 30−09−2004	DENOMINATION CIRCUITO AUSILIARIO *AUXILIARY CIRCUIT*			TOT. 17 / NEXT 16
	ORDER				

ABILITAZIONE INVERTER POMPA
ENABLE INVERTER PUMP

ABILITAZIONE INVERTER AGITATORE A VITE
ENABLE INVERTER SCREW AGITATOR

MARCIA–ARRESTO MOTORE USCITA MIXER
START–STOP MOTOR AFTER MIXER

15.9B 1506 — 1506 17.2A

1506 X1

WHITE

−11F1 13 — 11.1B — 14

−16S1 13 — 14

BRDWN

1601

1603 X1

1603 → 17.8C

−11Q1 13 — 11.4A — 14

−12F1 13 — 12.1B — 14

1604

−12Q1 13 — 12.4A — 14

1605

20.2D → 2001

−13Q1 13 — 13.1B — 14

1606

1602

−16K1 A1 A2

−16K2 A1 A2

−16K3 A1 A2

15.9E 1402 — 1402 17.0A

11.4B	2	1	
11.4B	4	3	
11.4B	6	5	
11.1C	14	13	
11.1C	54	53	
	62	61	

12.4B	2	1	
12.4B	4	3	
12.4B	6	5	
12.1C	14	13	
12.1C	54	53	
	62	61	

13.1C	2	1	
13.1C	4	3	
13.1C	6	5	
	14	13	

DRAW.N. 9.07.70.1000x06

DATE 30–09–2004

ORDER

PROJECT: IF 2000 400V

EXECUTOR: GRITTINI PAOLO

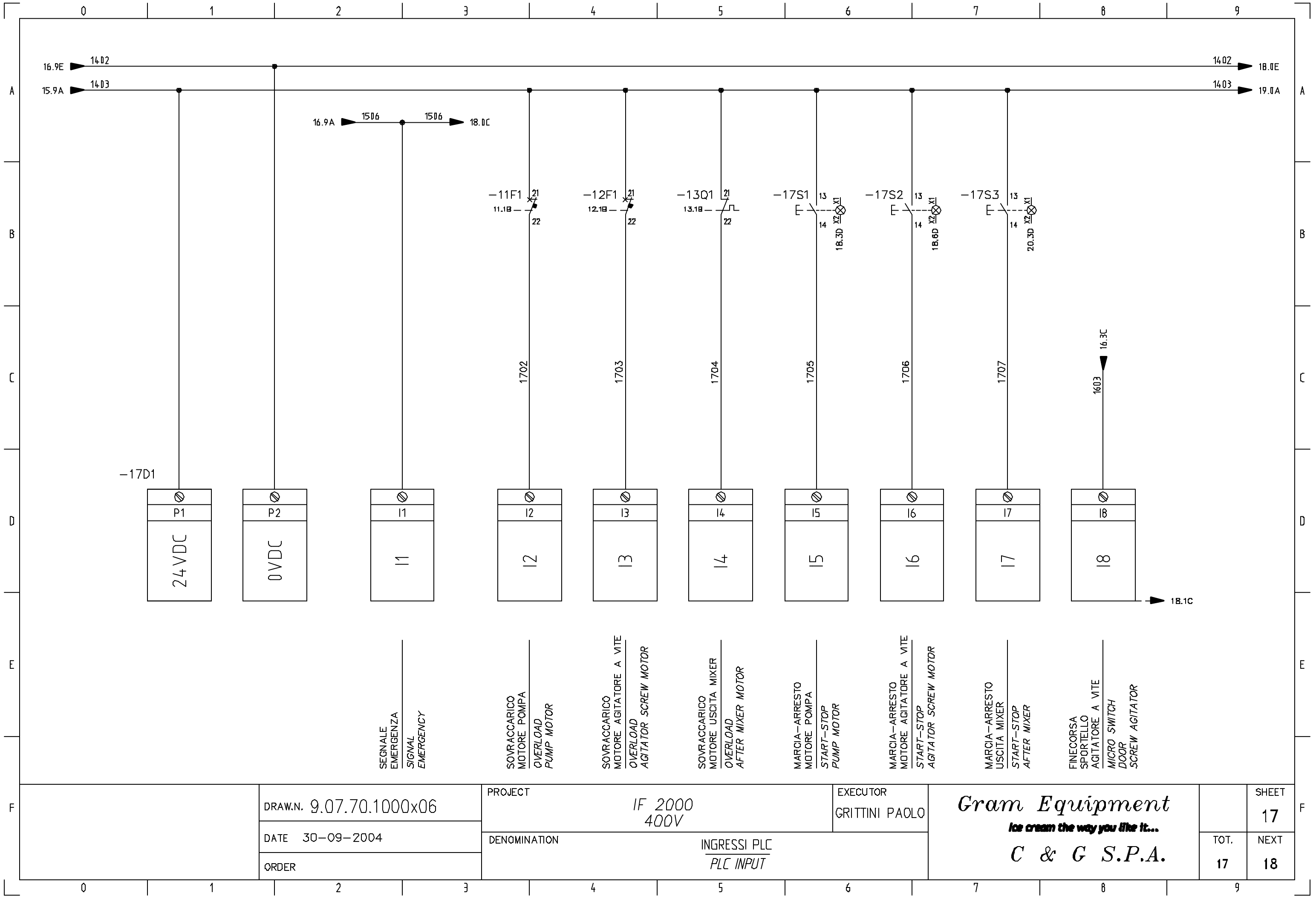
DENOMINATION: CIRCUITO AUSILIARIO / *AUXILIARY CIRCUIT*

Gram Equipment
ice cream the way you like it...
C & G S.P.A.

SHEET 16

TOT. 17

NEXT 17


16.9E 1402
15.9A 1403
1402 18.0E
1403 19.0A
16.9A 1506 1506 18.0C
−11F1 21 11.1B 22
−12F1 21 12.1B 22
−13Q1 21 13.1B 22
−17S1 13 14 X1 X2 18.3D
−17S2 13 14 X1 X2 18.6D
−17S3 13 14 X1 X2 20.3D
1702
1703
1704
1705
1706
1707
16.3C
1603
−17D1
P1 24VDC
P2 0VDC
I1 I2 I3 I4 I5 I6 I7 I8
18.1C
SEGNALE EMERGENZA / SIGNAL EMERGENCY
SOVRACCARICO MOTORE POMPA / OVERLOAD PUMP MOTOR
SOVRACCARICO MOTORE AGITATORE A VITE / OVERLOAD AGITATOR SCREW MOTOR
SOVRACCARICO MOTORE USCITA MIXER / OVERLOAD AFTER MIXER MOTOR
MARCIA-ARRESTO MOTORE POMPA / START-STOP PUMP MOTOR
MARCIA-ARRESTO MOTORE AGITATORE A VITE / START-STOP AGITATOR SCREW MOTOR
MARCIA-ARRESTO USCITA MIXER / START-STOP AFTER MIXER
FINECORSA SPORTELLO AGITATORE A VITE / MICRO SWITCH DOOR SCREW AGITATOR

DRAW.N. 9.07.70.1000x06
DATE 30-09-2004
ORDER

PROJECT: IF 2000 400V
EXECUTOR: GRITTINI PAOLO
DENOMINATION: INGRESSI PLC / PLC INPUT

Gram Equipment
ice cream the way you like it...
C & G S.P.A.

SHEET 17
TOT. 17
NEXT 18

MARCIA–ARRESTO MOTORE POMPA
START–STOP MOTOR PUMP

SPIA MOTORE POMPA
PILOT LIGHT MOTOR PUMP

MARCIA–ARRESTO MOTORE AGITATORE A VITE
START–STOP MOTOR SCREW AGITATOR

SPIA MOTORE AGITATORE A VITE
PILOT LIGHT MOTOR SCREW AGITATOR

Q1 | Q1 | Q2 | Q2 | Q3 | Q3 | Q4 | Q4

1 | 2 | 1 | 2 | 1 | 2 | 1 | 2

17.8E

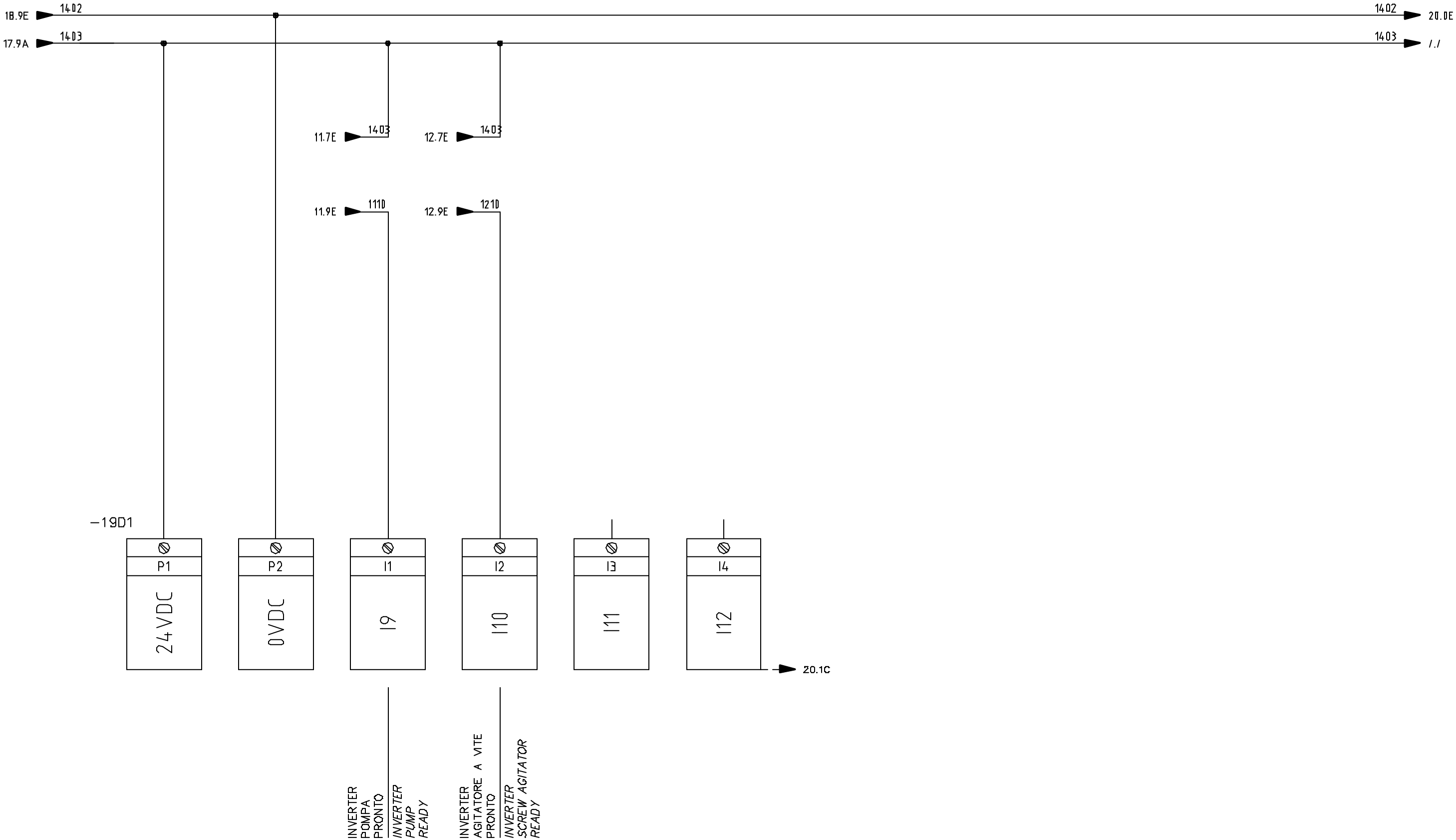
17.3A 1506 — 1506 20.0C

1801 → 11.5C
1802 → 11.6C
1803
1804 → 12.5C
1805 → 12.6C
1806

−17S1 X1 17.6B WHITE X2
−17S2 X1 17.6B WHITE X2

17.9A 1402 — 1402 19.0A

	DRAW.N. 9.07.70.1000x06	PROJECT *IF 2000 400V*	EXECUTOR GRITTINI PAOLO	*Gram Equipment* *Ice cream the way you like it...* *C & G S.P.A.*	SHEET 18
	DATE 30–09–2004	DENOMINATION USCITE PLC / *PLC OUT*			TOT. 17 / NEXT 19
	ORDER				



DRAW.N. 9.07.70.1000x06	PROJECT IF 2000 400V	EXECUTOR GRITTINI PAOLO	Gram Equipment ice cream the way you like it... C & G S.P.A.	SHEET 19
DATE 30-09-2004	DENOMINATION INGRESSI PLC / PLC INPUT			TOT. 17 / NEXT 20
ORDER				

MARCIA-ARRESTO
MOTORE
USCITA MIXER
START-STOP
MOTOR
AFTER MIXER

SPIA
MOTORE
USCITA MIXER
PILOT LIGHT
MOTOR
AFTER MIXER

Q5	Q5	Q6	Q6	Q7	Q7	Q8	Q8
1	2	1	2	1	2	1	2

19.5E

18.9C 1506

2001

16.4B

2002

−17S3 X1
17.7B
WHITE X2

19.9A 1402

	DRAW.N. 9.07.70.1000x06	PROJECT *IF 2000 400V*	EXECUTOR GRITTINI PAOLO	*Gram Equipment* *ice cream the way you like it...* *C & G S.P.A.*	SHEET 20
	DATE 30-09-2004	DENOMINATION USCITE PLC / *PLC OUT*			TOT. 17 / NEXT 21
	ORDER				

ITEM	CODE	COSTRUCTOR	DESCRIPTION	DRAW	PANEL
-10QS1	194 L-HE6G-175	ALLEN-BRADLEY	ACTUATOR/PLASTRON/ANTRIEB/MANIGLIA	10	+A1
-10QS1	194E-25-C3	ALLEN-BRADLEY	PROTECTION/PROTECTION/SCHUTZ/PROTEZIONE	10	+A1
-10QS1	194E-A25-1753	ALLEN-BRADLEY	LOADSWITCH/SECTIONATEUR/LASTSCHALTER/SECCIONADOR/SEZIONATORE	10	+A1
-10QS1	194L-G3393	ALLEN-BRADLEY	EXTENSION-SHAFT/ARBRE-D'EXTENSION/WELLENVERLANGERUNG/ARBOL-DE-EXTENSION/PROLUNGA D'ALBERO	10	+A1
-11F1	5ST3010	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	11	+A1
-11F1	5SY6101-7	SIEMENS	CIRCUIT-BREAKER/DISJONCTEUR/LEISTUNGSSHALTER/INTERRUPTOR-AUTOMATICO/INTERRUTTORE-AUTOMATICO	11	+A1
-11G1	6SE6400-2FA00-6AD00	SIEMENS	FILTRE/FILTER/FILTRO	11	+A1
-11Q1	3RV1011-1BA15	SIEMENS	OVERLOAD-RELAY/DISJONCTEUR-MOTEUR/LEISTUNGSCHALTER/RELE SOBRECARGA/INTERRUTTORE	11	+A1
-11Q1	3RV1915-1AB	SIEMENS	BAR CONNECTION/SBARRA CONNESSIONE	11	+A1
-11R1	5 KOHM	GRAM EQUIPMENT	POTENTIOMETER/POTENTIOMETRE/POTENCIOMETRO/POTENZIOMETRO	11	+A1
-11R1	800EP-POT	ALLEN-BRADLEY	POTENTIOMETER ADAPTER	11	+A1
-11U1	6SE6400-0BP00-0AA0	SIEMENS	KEYBOARD/CLAVIER/TASTATUR/TECLADO/TASTIERA	11	+A1
-11U1	6SE6420-2UD15-5AA1	SIEMENS	INVERTER/FREQUENZREGLER	11	+A1
-12F1	5ST3010	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	12	+A1
-12F1	5SY6101-7	SIEMENS	CIRCUIT-BREAKER/DISJONCTEUR/LEISTUNGSSHALTER/INTERRUPTOR-AUTOMATICO/INTERRUTTORE-AUTOMATICO	12	+A1
-12G1	6SE6400-2FA00-6AD00	SIEMENS	FILTRE/FILTER/FILTRO	12	+A1
-12Q1	3RV1011-1BA15	SIEMENS	OVERLOAD-RELAY/DISJONCTEUR-MOTEUR/LEISTUNGSCHALTER/RELE SOBRECARGA/INTERRUTTORE	12	+A1
-12R1	5 KOHM	GRAM EQUIPMENT	POTENTIOMETER/POTENTIOMETRE/POTENCIOMETRO/POTENZIOMETRO	12	+A1
-12R1	800EP-POT	ALLEN-BRADLEY	POTENTIOMETER ADAPTER	12	+A1
-12U1	6SE6420-2UD15-5AA1	SIEMENS	INVERTER/FREQUENZREGLER	12	+A1
-13Q1	3RV1011-1AA15	SIEMENS	OVERLOAD-RELAY/DISJONCTEUR-MOTEUR/LEISTUNGSCHALTER/RELE SOBRECARGA/INTERRUTTORE	13	+A1
-14EV1	3142-0148-00-05	HAWA	PROTECTION/PROTECTION/SCHUTZ/PROTEZIONE	14	+A1
-14EV1	80382ASW	COMESTERO	VENTILATOR/VENTILATEUR/LUFTER/VENTILATORE	14	+A1
-14EV1	GM80	COMESTERO	FILTRE/FILTER/FILTRO	14	+A1
-14F1	5SY6202-7	SIEMENS	CIRCUIT-BREAKER/DISJONCTEUR/LEISTUNGSSHALTER/INTERRUPTOR-AUTOMATICO/INTERRUTTORE-AUTOMATICO	14	+A1
-14F2	5SY6102-7	SIEMENS	CIRCUIT-BREAKER/DISJONCTEUR/LEISTUNGSSHALTER/INTERRUPTOR-AUTOMATICO/INTERRUTTORE-AUTOMATICO	14	+A1
-14F3	1A T 500.00.43	WIMEX	FUSE/FUSIBILE	14	+A1
-14F3	UK-SI-3118012	PHOENIX-CONTACT	FUSIBLE.ADAPT.FUSIBILE.ADAPT./SICHERUNGEN.ADAPTAT.	14	+A1
-14H1	3SB3244-6AA60	SIEMENS	PILOT-LIGHT/VOYANT/ANZEIGER/SENALADOR/SPIA	14	+A1
-14T1	TM250VA 400/24/230	MG ELETTROMECCANICA	TRANSFORMER/TRANSFORMATEUR/TRANSFORMATOR	14	+A1
-15K1	3RH1921-1FA31	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	15	+A1

DRAW.N. 9.07.70.1000x06

DATE 30-09-2004

ORDER

PROJECT
IF 2000
400V

EXECUTOR
GRITTINI PAOLO

DENOMINATION
LEGENDA
ITEM DESIGNATION

Gram Equipment
ice cream the way you like it...
C & G S.P.A.

SHEET 21

TOT. 17

NEXT 22

ITEM	CODE	COSTRUCTOR	DESCRIPTION	DRAW	PANEL
-15K1	3RT1025-1AC20	SIEMENS	CONTACTOR/CONTACTEUR/SCHUETZ/CONTACTOR/CONTATTORE	15	+A1
-15S1	3SB3203-1HA20	SIEMENS	PUSHBUTTON/BOUTON/DRUCK/PULSADOR/PULSANTE	15	+A1
-15S1	3SB3400-0C	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	15	+A1
-15S2	3SB3245-0AA51	SIEMENS	PUSHBUTTON/BOUTON/DRUCK/PULSADOR/PULSANTE	15	+A1
-16K1	3RH1911-1FA11	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	16	+A1
-16K1	3RT1016-1AB01	SIEMENS	CONTACTOR/CONTACTEUR/SCHUETZ/CONTACTOR/CONTATTORE	16	+A1
-16K1	3ZT1916-1BB00	SIEMENS	PROTECTION/PROTECTION/SCHUTZ/PROTEZIONE	16	+A1
-16K2	3RH1911-1FA11	SIEMENS	CONTACT/KONTAKTE/CONTACT/CONTATTO	16	+A1
-16K2	3RT1016-1AB01	SIEMENS	CONTACTOR/CONTACTEUR/SCHUETZ/CONTACTOR/CONTATTORE	16	+A1
-16K3	3RT1016-1AB01	SIEMENS	CONTACTOR/CONTACTEUR/SCHUETZ/CONTACTOR/CONTATTORE	16	+A1
-17D1	6ED1052-1HB00-0BA4	SIEMENS	CPU LOGO	17	+A1
-17S1	3SB3001-0AA61	SIEMENS	PUSHBUTTON/BOUTON/DRUCK/PULSADOR/PULSANTE	17	+A1
-17S2	3SB3001-0AA61	SIEMENS	PUSHBUTTON/BOUTON/DRUCK/PULSADOR/PULSANTE	17	+A1
-17S3	3SB3001-0AA61	SIEMENS	PUSHBUTTON/BOUTON/DRUCK/PULSADOR/PULSANTE	17	+A1
-19D1	6ED1055-1HB00-0BA0	SIEMENS	EXPANSION LOGO	19	+A1
-16S1	3SE6605 -2BA	SIEMENS	CONTACT-BLOCK/CONTACT-FIN-COURSE/GRENZTAST./FINECORSA-MAGNETICO	16	+BM
-16S1	3SE6704-2BA	SIEMENS	SWITCHING_MAGNET/CONTACT-FIN-COURSE/GRENZTAST./FINECORSA-MAGNETICO	16	+BM

DRAW.N. 9.07.70.1000x06

DATE 30-09-2004

ORDER

PROJECT: IF 2000 400V

EXECUTOR: GRITTINI PAOLO

DENOMINATION: LEGENDA / ITEM DESIGNATION

Gram Equipment

ice cream the way you like it...

C & G S.P.A.

SHEET 22

TOT. 17

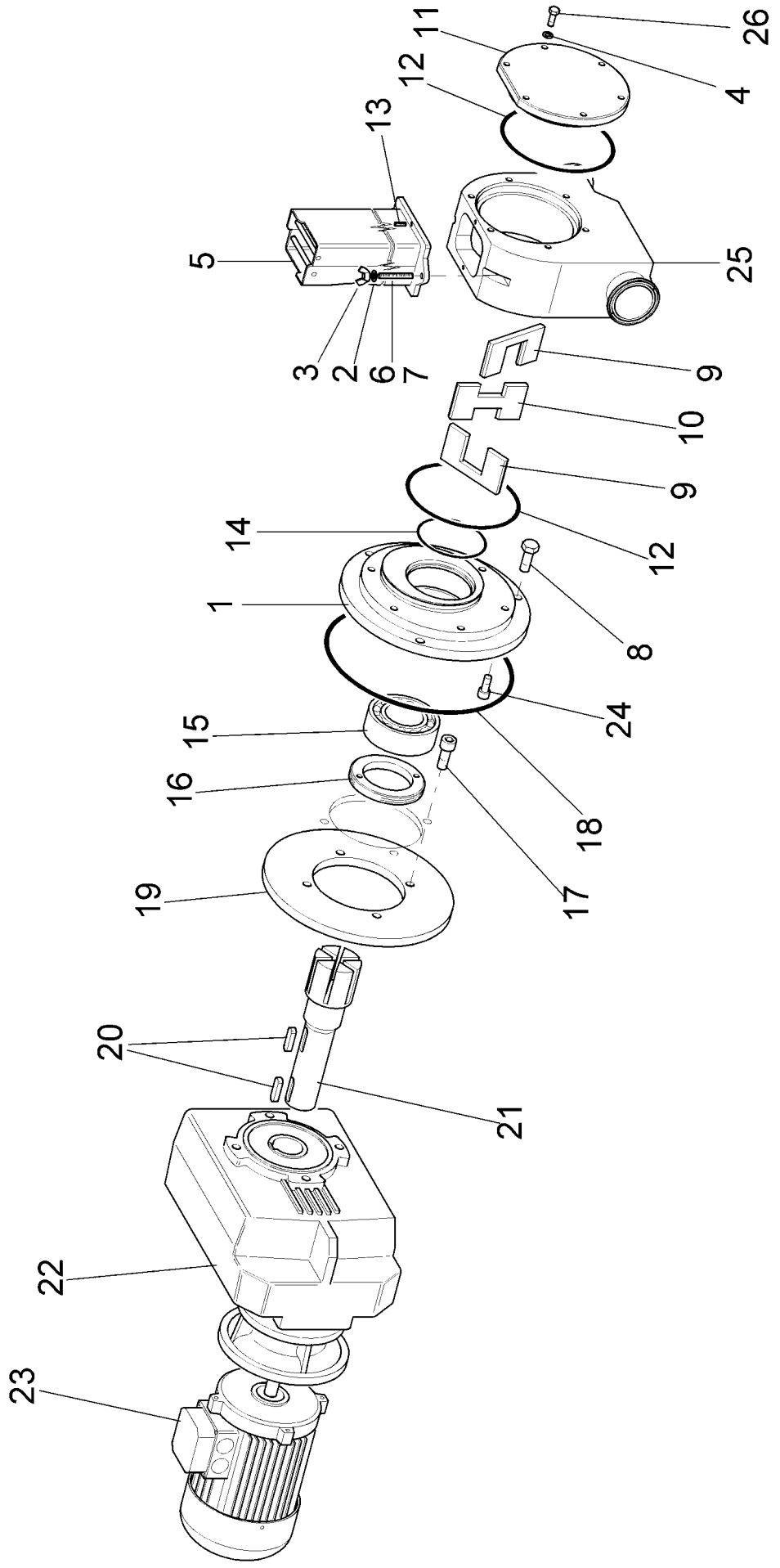
NEXT /

10.2 ASSEMBLY DRAWINGS

N. PROG.	CODE	DESCRIPTION	N. ATTACHED SHEETS
1	5000369	PUMP ASSEMBLY	1
2	5000356	AFTER MIXER ASSEMBLY	1
3	5000358	HOPPER SHAKER ASSEMBLY	1
4	5000359	GENERAL ASSEMBLY	1
5	5000364	KIT TOOLS	1

Drwng. Nr. 5000369

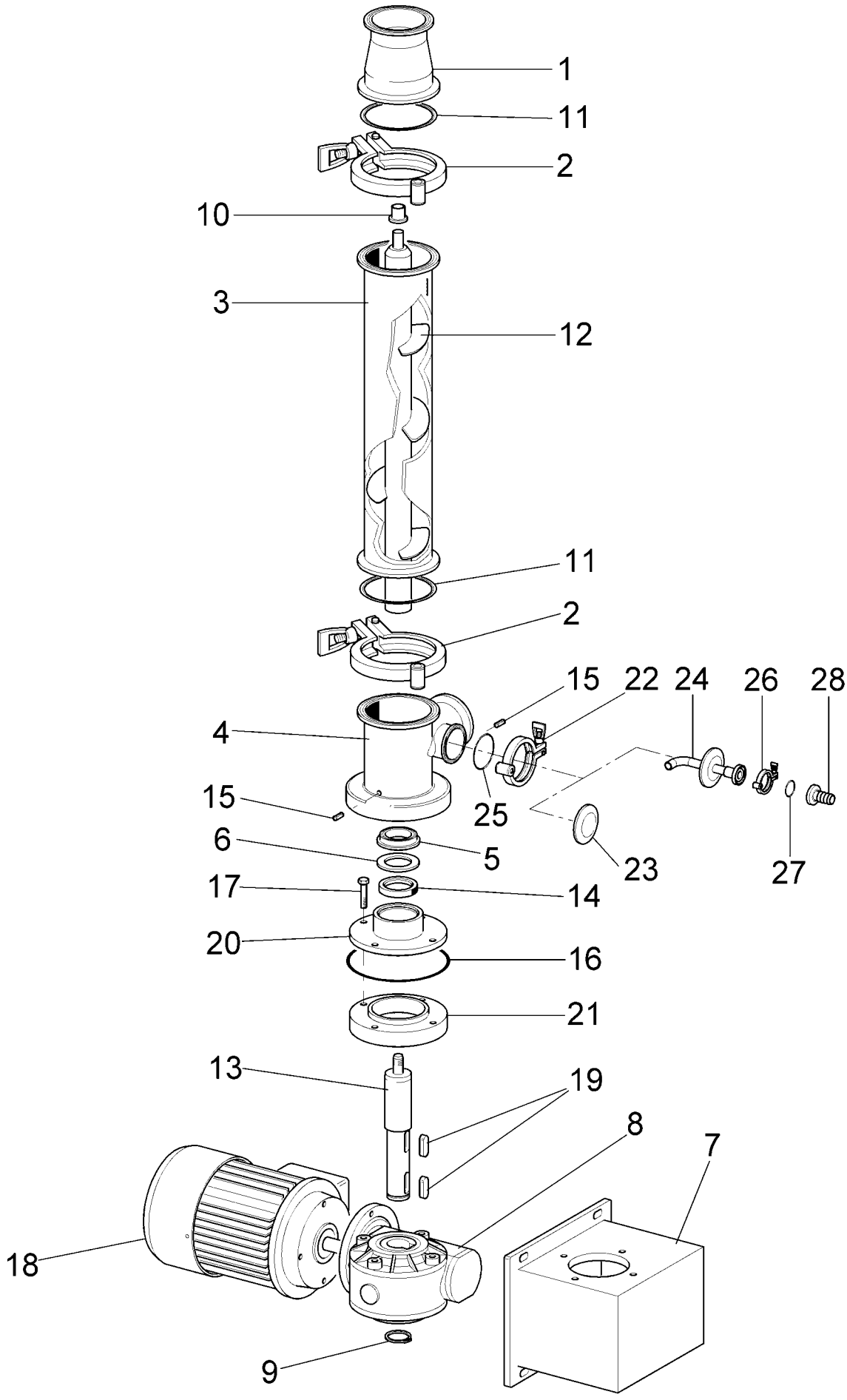
POS.	CODE	DESCRIPTION
1	1240005	INNER LID
2	2031008	FLAT WASHER
3	2025008	NUT
4	2031008	FLAT WASHER
5	1970001	HOPPER FOR PUMP
6	2010241	TENSION ROD
7	1640040	PARALLEL PIN
8	2015714	TE SCREW M10x35
9	1600015	LATERAL PADDLE
10	1600016	CENTRAL PADDLE
11	7240322	LID
12	2166450	GASKET
13	2091035	PARALLEL PIN
14	2164312	GASKET
15	4140217	BEARING
16	7320326	RING NUT
17	2015104	TCEI SCREW M10x30
18	2164875	GASKET
19	1660121	PLATE
20	2060188	FEATHER
21	1720052	ROTOR
22	4021077	REDUCTION GEAR
23	4021082	MOTOR
24	2015086	TCEI SCREW M8x25
25	7070168	PUMP BODY
26	/	TE SCREW M8x20



DRWNG. NR. 5000369 PUMP ASSEMBLY

Drwng. Nr. 5000356

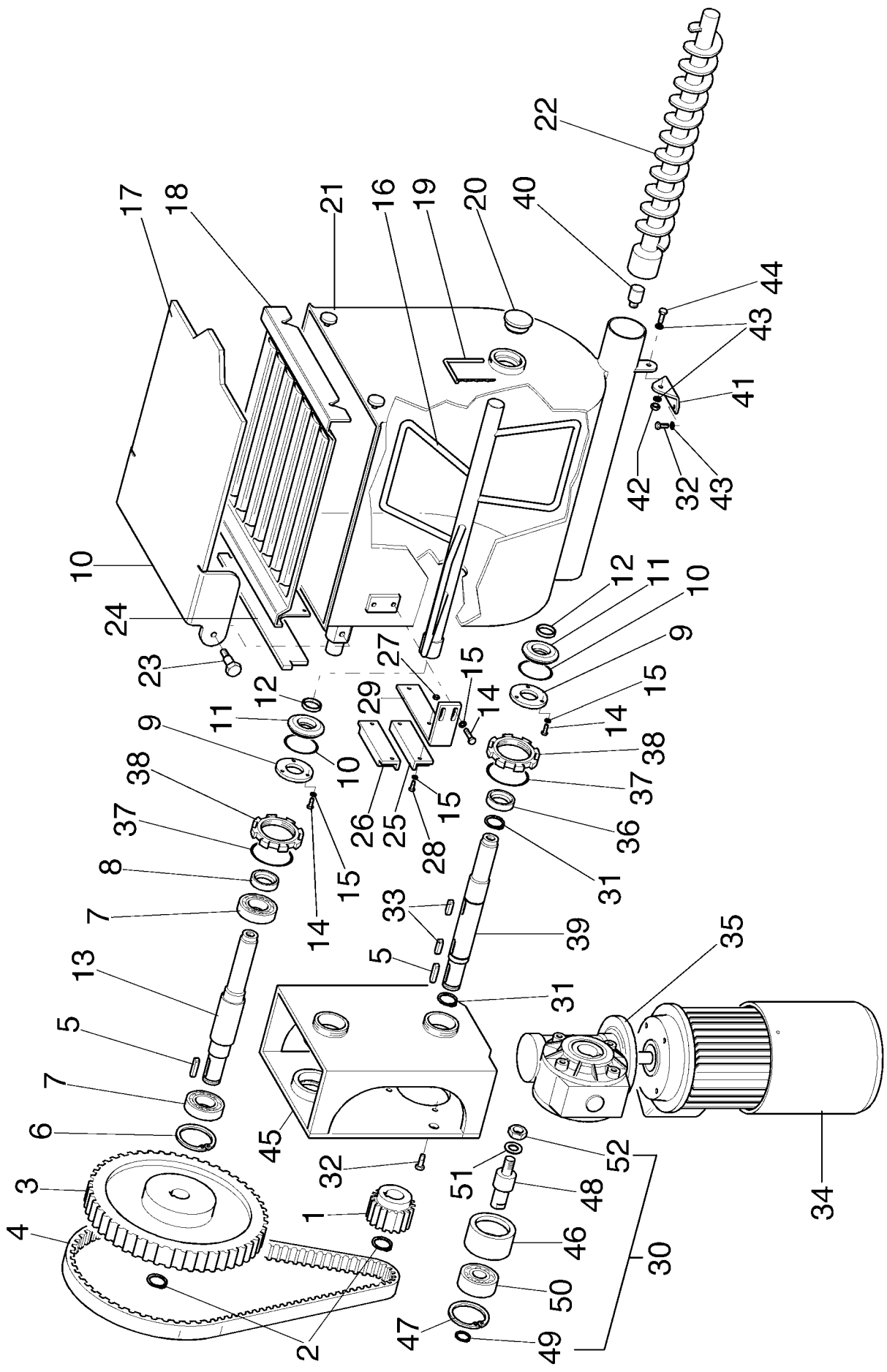
POS.	CODE	DESCRIPTION
1	1220032	TERMINAL MANIFOLD
2	4170008	CLAMP
3	1220030	PIPE
4	1220031	LOWER CONNECTOR
5	2210028	GASKET
6	1790023	SPECIAL WASHER
7	1880009	REDUCTION GEAR SUPPORT CASE
8	4021079	REDUCTION GEAR
9	2070025	ELASTIC RING
10	1130078	BUSH FOR CENTER SQUARE
11	2180030	GASKET
12	1050068	AFTER MIXER SHAFT
13	1050069	AFTER MIXER HANDLING SHAFT
14	2190221	GROMMET
15	2040081	DOWEL
16	2164425	GASKET
17	2015648	TE SCREW M6x40
18	4021083	MOTOR
19	2060073	FEATHER
20	1370153	CENTER SQUARE
21	1350044	SPACER FOR REDUCTION GEAR
22	4170001	CLAMP
23	4170102	PLUG
24	1220033	ENTRY MANIFOLD
25	2180012	GASKET
26	4170030	CLAMP
27	2180037	GASKET
28	4160726	RUBBER HOLDER



DRWNG. NR. 5000356 AFTER MIXER ASSEMBLY

Drwng. Nr. 5000358

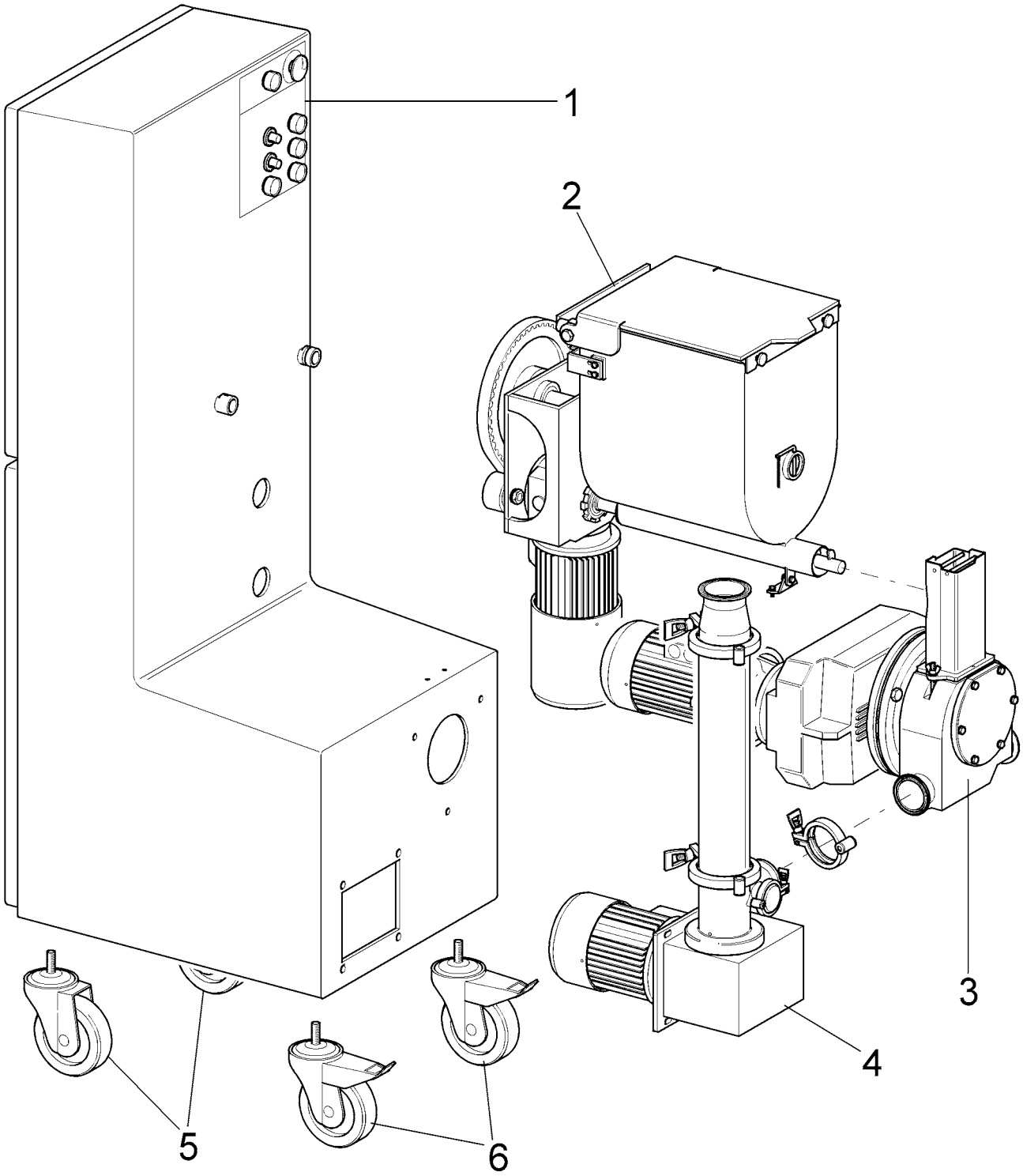
POS.	CODE	DESCRIPTION
1	1680001	DRIVING PULLEY
2	2070020	SNAP RING
3	1680002	DRIVEN PULLEY
4	4290868	DRIVEN PULLEY
5	2060056	FEATHER
6	2071047	SNAP RING
7	4140096	BEARING
8	2190124	GROMMET
9	1370154	EXTERNAL RING
10	2163150	GASKET
11	1370155	INNER RING
12	2190906	GASKET
13	1050070	SHAKER HANDLING SHAFT
14	2015602	TE SCREW M4x12
15	2031004	FLAT WASHER
16	1020028	SHAKER
17	1240003	TRANSPARENT LID
18	1340015	GRATE
19	1010056	CENTER SQUARE SEAL PISTON PIN
20	1370156	CENTER SQUARE FOR SHAKER
21	1970002	HOPPER
22	1020029	AUGER
23	1950051	SCREW
24	1880010	HOPPER FIXING PLATE
25	4111450	SENSOR
26	4111451	OPERATION FOR SENSOR
27	2020004	EXAGONAL NUT
28	2015802	TSEI SCREW M4x10
29	1880011	SENSOR SUPPORT
30	5000357	TIGHTENER ASSEMBLY
31	2070025	ELASTIC RING
32	2015657	TE SCREW M6x14
33	2060086	FEATHER
34	4021080	MOTOR
35	4021081	REDUCTION GEAR
36	2190153	GROMMET
37	2163206	GASKET
38	1320023	MOTOR DRIVE FIXING RING NUT
39	1050071	AUGER MOTOR DRIVE SHAFT
40	1950052	INSERT
41	1490013	HOPPER SEAL ANGULAR
42	2020206	EXAGONAL NUT
43	2031006	FLAT WASHER
44	2015643	TE SCREW M6x16
45	1880012	MOTORIZZAZIONE MOTOR DRIVE SUPPORT CASE
46	1800001	SCREW COUPLING ROLLER
47	2071047	ELASTIC RING
48	1640041	PIN
49	2070017	ELASTIC RING
50	4140169	BEARING
51	2031012	FLAT WASHER
52	2020212	EXAGONAL NUT



DRWNG. NR. 5000358 HOPPER SHAKER ASSEMBLY

Drwng. Nr. 5000359

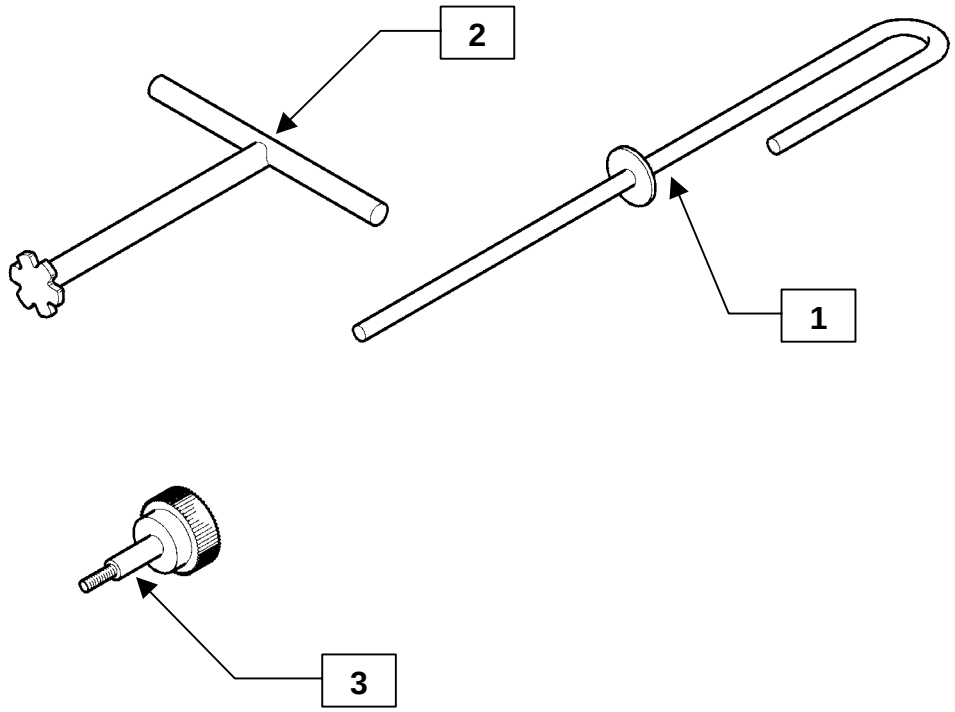
POS.	CODE	DESCRIPTION
1	1100174	FRAME
2	5000358	HOPPER SHAKER ASSEMBLY
3	5000369	PUMP ASSEMBLY
4	5000356	AFTER MIXER ASSEMBLY
5	4220058	WHEEL
6	4220059	WHEEL WITH BRAKE



DRWNG. NR. 5000359 GENERAL ASSEMBLY

Drwng. Nr. 5000364

POS.	CODE	DESCRIPTION
1	1020030	MANUAL SHAKER
2	1010059	TOOL EXTRACTION DEVICE FOR ROTOR
3	1010058	SCREW EXTRACTION DEVICE FOR LID



DRWNG. NR. 5000364 KIT TOOLS

10.3 SPARE PARTS ORDERING PROCEDURE

Change a component in a favourable moment it means to maintain the plant working in best conditions and at the same time to avoid worst damages.

You can follows three kinds of orders:

A.- REQUEST OF MECHANICAL OR COMMERCIAL SPARE PARTS WHICH ARE BROKEN OR WORN.

PROCEDURE A

- **IDENTIFY IF IT IS POSSIBLE THE PART BROKEN OR WORN ON THE PLANT.**
- **IDENTIFY TO WHICH PART OF THE MACHINE THE PIECE BROKEN OR WORN BELONGS.**
- **WHEN YOU HAVE IDENTIFY THE GROUP YOU HAVE TO FULL FILL THE FORM AS FOLLOWS:**

B.- REQUEST OF MECHANICAL OR COMMERCIAL SPARE PARTS MORE WORN.

PROCEDURE B

- **IDENTIFY THE PARTS WHICH ARE MORE WORN.**
- **IDENTIFY TO WHICH PART OF THE MACHINE THE PIECE BROKEN OR WORN BELONGS USING YOUR INSTRUCTION MANUAL.**
- **WHEN YOU HAVE IDENTIFY THE GROUP YOU HAVE TO FULL FILL THE FORM AS FOLLOWS:**

C.- REQUEST OF MECHANICAL OR COMMERCIAL MATERIAL BROKEN OR WORN IN CASE THAT YOU ARE NOT ABLE TO IDENTIFY TO WHICH PART OF THE MACHINE THE PIECE BELONGS USING THE INSTRUCTION MANUAL.

PROCEDURE C

- **FULL FILL THE SPARE PARTS REQUEST FORM AS FOLLOWS:**

PROCEDURE A/B

SPARE PARTS REQUEST FORM
Please photocopy this form, fulfil it and sent by mail or fax to:

Spett.le
C & G S.p.A.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@gram-equipment.it
Internet: www.gram-equipment.it

Customer……Tel……..Fax…….

City……Country……..

Machine model……

Serial no……...

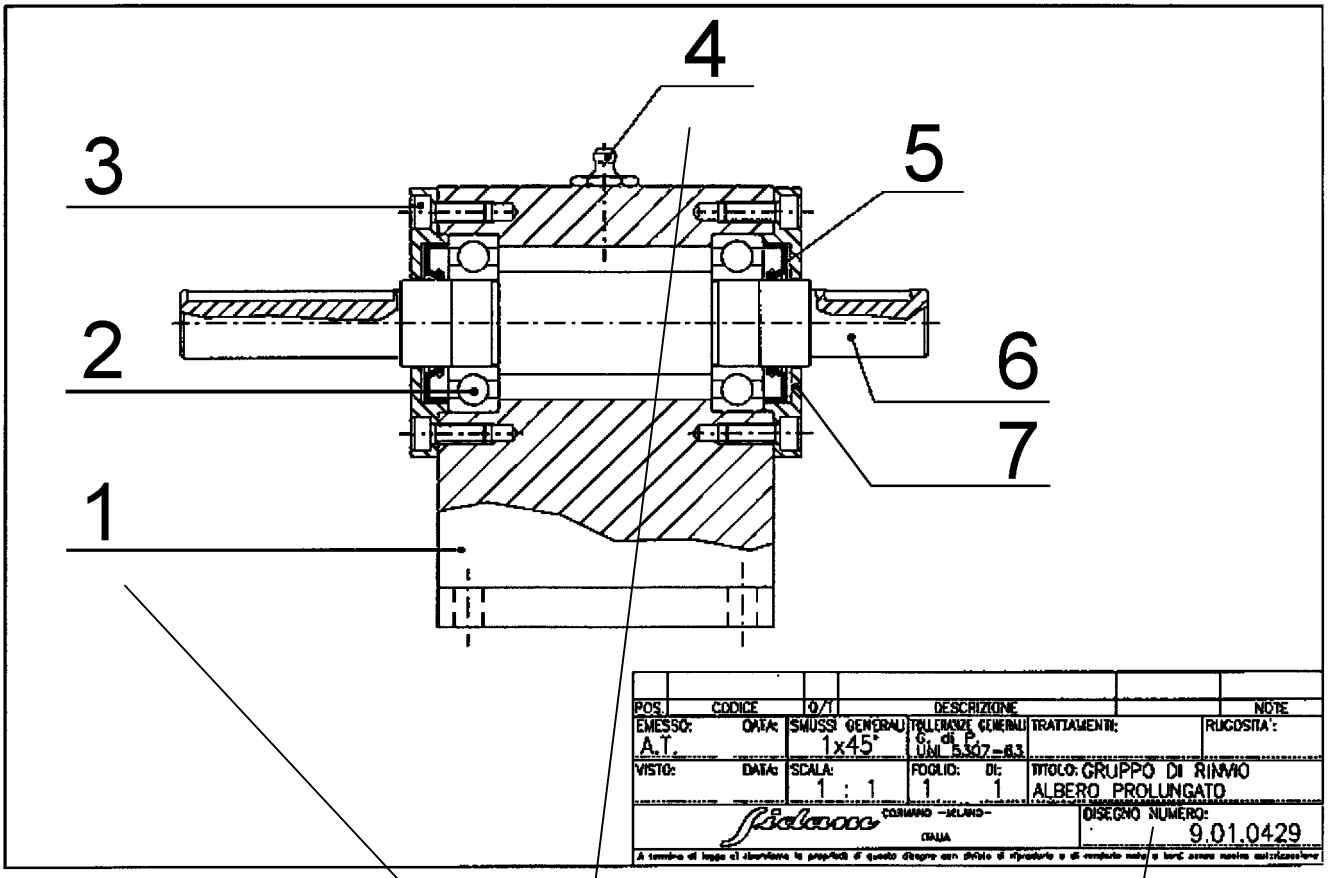
Machine no.……

Group no.	Position	Description	Q.ty
9.01.0429	1	SUPPORT	1

EXAMPLE

Best Regards,

(Stamp and Signature)



POSITION CONCERNING THE MEMBER BROKEN OR WORN

NUMBER TO IDENTIFY TO WHICH GROUP OF THE MACHINE THE PIECE BELONGS

PROCEDURE A/B

SPARE PARTS REQUEST FORM
Please photocopy this form, fulfil it and sent by mail or fax to:

Spett.le
C & G S.p.A.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@gram-equipment.it
Internet: www.gram-equipment.it

Customer……Tel……..Fax……..

City……County……..

Machine model:……

Serial no. ……..

Machine no.……

Group number	Position	Description	Q.ty

Best Regards,

(Stamp and Signature)

PROCEDURE C

SPARE PARTS REQUEST FORM
Please photocopy this form, full fill it and sent by mail or fax to:

Spett.le
C & G S.p.A.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@gram-equipment.it
Internet: www.gram-equipment.it

Customer……Tel……..Fax…….

City……Country……..

Machine model……

Serial no. ……..

Machine no……

Detailed description concerning the broken or worn piece (support, bearing, shaft, seal, etc.)
Support broken which get in movement the selector near the chain stretch EXAMPLE

Best Regards,

(Stamp and signature)

PROCEDURE C

SPARE PARTS REQUEST FORM
Please photocopy this form, full fill it and sent by mail or fax to:

Spett.le
C & G S.p.A.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@gram-equipment.it
Internet: www.gram-equipment.it

Customer……Tel……..Fax…….

City……Country……..

Machine model…….

Serial no. ……..

Machine no……

Detailed description concerning the broken or worn piece (support, bearing, shaft, seal, etc.)

Best Regards,

(Stamp and signature)

11. EQUIPMENT SPARE PARTS LIST

COMPONENT	DESCRIPTION	QUANTITY
2160203	GASKET	2
2210027	GASKET	1
2164875	GASKET	1
2210028	GASKET	1
2180030	GASKET	2
2190221	GASKET	1
2164425	GASKET	1
2190124	GASKET	1
2163150	GASKET	2
2190906	GASKET VARISEAL	2
2190153	GROMMET	1
2163206	GASKET	2

12. COMMERCIAL COMPONENTS

FREQUENCY INVERTER	SIEMENS

SIEMENS

MICROMASTER 420
0.12 kW - 11 kW

Operating Instructions **Issue 12/01**

User Documentation
6SE6400-5AA00-0BP0

MICROMASTER 420 Documentation

Getting Started Guide

Is for quick commissioning with SDP and BOP.

Operating Instructions

Gives information about features of the MICROMASTER 420, Installation, Commissioning, Control modes, System Parameter structure, Troubleshooting, Specifications and available options of the MICROMASTER 420.

Parameter List

The Parameter List contains the description of all Parameters structured in functional order and a detailed description. The Parameter list also includes a series of function plans.

Reference Manual

The Reference Manual gives detailed information about engineering communication troubleshooting and maintenance.

Catalogues

In the catalogue you will find all the necessary information to select an appropriate inverter, as well as filters, chokes, operator panels and communication options.

SIEMENS

MICROMASTER 420

0.12 kW - 11 kW

Operating Instructions
User Documentation

Valid for Release Issue 12/01

Inverter Type
MICROMASTER 420
0.12 kW - 11 kW

Control Version
V1.1

Issue 12/01

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Further information is available on the Internet under:

http://www.siemens.de/micromaster

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Other functions not described in this document may be available. However, this fact shall not constitute an obligation to supply such functions with a new control, or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. There may be discrepancies nevertheless, and no guarantee can be given that they are completely identical. The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

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Siemens-Aktiengesellschaft

Foreword

User Documentation

WARNING

Before installing and commissioning, you must read the safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

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http://www.siemens.de/micromaster

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Should any questions or problems arise while reading this manual, please contact the Siemens office concerned using the form provided at the back this manual.

Definitions and Warnings

DANGER

indicates an immiently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situationwhich, if not avoided, may result in minor or moderate injury.

CAUTION

used without safety alert symbol indicates a potentially hzardous situation which, if not avoided, may result in a property demage.

NOTICE

indicates a potential situation which, if not avoided, may result in an undesireable result or state.

NOTES

For the purpose of this documentation, "Note" indicates important information relating to the product or highlights part of the documentation for special attention.

Qualified personnel

For the purpose of this Instruction Manual and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid.

PE

= Ground

- PE – Protective Earth uses circuit protective conductors sized for short circuits where the voltage will not rise in excess of 50 Volts. This connection is normally used to ground the inverter.
- - Is the ground connection where the reference voltage can be the same as the Earth voltage. This connection is normally used to ground the motor.

Use for intended purpose only

The equipment may be used only for the application stated in the manual and only in conjunction with devices and components recommended and authorized by Siemens.

Safety Instructions

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists Warnings, Cautions and Notes, which apply generally when handling MICROMASTER 420 Inverters, classified as **General**, **Transport & Storage**, **Commissioning**, **Operation**, **Repair** and **Dismantling & Disposal**.

Specific Warnings, Cautions and Notes that apply to particular activities are listed at the beginning of the relevant chapters and are repeated or supplemented at critical points throughout these chapters.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 420 Inverter and the equipment you connect to it.

General

WARNING

- This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with **Warnings** or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.
- Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.
- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. **It is not permissible to open the equipment until 5 minutes after the power has been removed.**
- **HP ratings are based on the Siemens 1LA motors and are given for guidance only, they do not necessarily comply with UL or NEMA HP ratings.**

CAUTION

- Children and the general public must be prevented from accessing or approaching the equipment!
- This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

NOTICE

- Keep these operating instructions within easy reach of the equipment and make them available to all users
- Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code VBG 4.0 must be observed, in particular § 8 “Permissible Deviations when Working on Live Parts”. Suitable electronic tools should be used.
- Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Transport & Storage

WARNING

- Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.

CAUTION

- Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures (*see table on page 76*).

Commissioning

WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - *see DIN VDE 0160, section 5.5.2 and EN50178 section 5.2.11.1*).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+, DC-
- This equipment must not be used as an ‘emergency stop mechanism’ *(see EN 60204, 9.2.5.4)*

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 Seite 29, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

Operation

WARNING

- Motor parameters must be accurately configured for the motor overload protection to operate correctly.
- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230 V / 460 V when protected by a time delay fuse (*see Tables see Tables starting on page 77).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

Repair

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

Dismantling & Disposal

NOTES

- The inverter's packaging is re-usable. Retain the packaging for future use or return it to the manufacturer.
- Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can then re-cycle these component parts, dispose of them in **accordance with local requirements or return them to the manufacturer.**

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1 Overview

This Chapter contains:

A summary of the major features of the MICROMASTER 420 range.

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1.1 The MICROMASTER 420

The MICROMASTER 420s are a range of frequency inverters for controlling the speed of three phase AC motors. The various models available range from the 120 W single phase input to the 11 kW three phase input.

The inverters are microprocessor-controlled and use state-of-the-art Insulated Gate Bipolar Transistor (IGBT) technology. This makes them reliable and versatile. A special pulse-width modulation method with selectable Pulse frequency permits quiet motor operation. Comprehensive protective functions provide excellent inverter and motor protection.

The MICROMASTER 420 with its default factory settings, is ideal for a large range of simple motor control applications. The MICROMASTER 420 can also be used for more advanced motor control applications via its comprehensive parameter lists.

The MICROMASTER 420 can be used in both 'stand-alone' applications as well as being integrated into 'Automation Systems'.

1.2 Features

Main characteristics

- Easy installation
- Easy commissioning
- Rugged EMC design
- Can be operated on IT line supplies
- Fast repeatable response time to control signals
- Comprehensive range of parameters enabling configuration for widest range of applications
- Simple cable connection
- Modular design for extremely flexible configuration
- High switching frequencies for low-noise motor operation
- Detailed status information and integrated message functions
- External options for PC communications, Basic Operator Panel (BOP), Advanced Operator Panel (AOP) and Profibus Communications Module

Performance characteristics

- Flux Current Control (FCC) for improved dynamic response and motor control
- Fast Current Limitation (FCL) for operation with trip-free mechanism
- Built-in DC brake
- Compound Braking to improve braking performance
- Acceleration/deceleration times with programmable smoothing
- Closed-loop control using Proportional, Integral (PI) control loop function
- Multi-point V/f characteristic

Protection characteristics

- Overvoltage/undervoltage protection
- Overtemperature protection for the inverter
- Ground fault protection
- Short-circuit protection
- i^2t thermal motor protection
- PTC for motor protection

2 Installation

This Chapter contains:

- General data relating to installation
- Dimensions of Inverter
- Wiring guidelines to minimize the effects of EMI
- Details concerning electrical installation

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2.2 Ambient operating conditions 21
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WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three-phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker EN50178 Section 5.2.11.1).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+, DC-
- Always wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*
- The minimum size of the earth bonding conductor must be equal to or greater than the cross-section of the power supply cables.

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 on page 29, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

2.1 General

Installation after a Period of Storage

Following a prolonged period of storage, you must reform the capacitors in the inverter. The requirements are listed below.

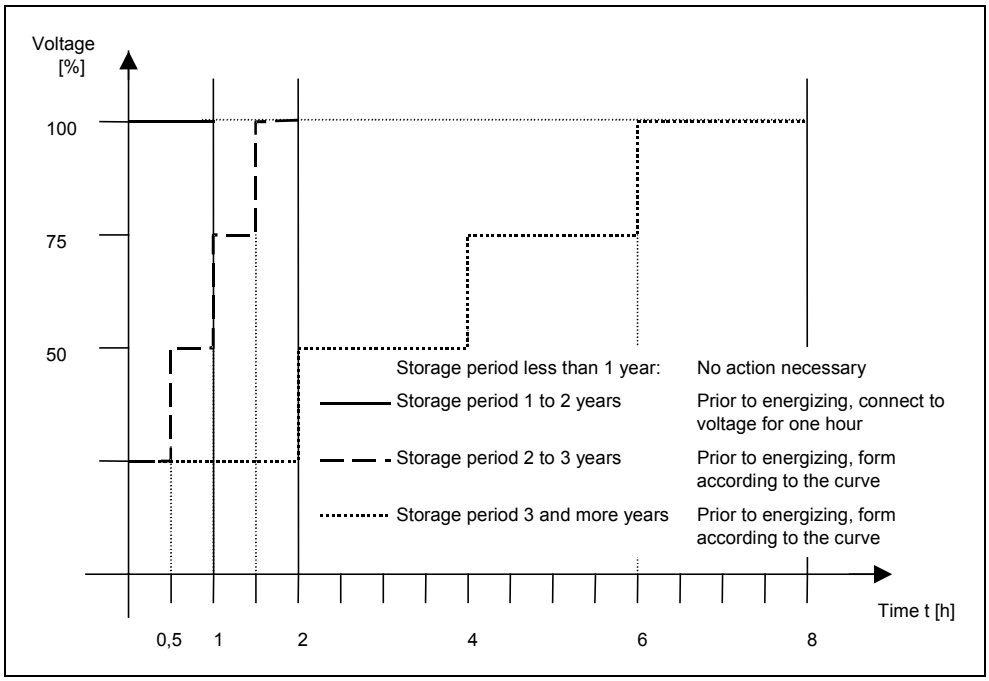


Figure 2-1 Forming

2.2 Ambient operating conditions

Temperature

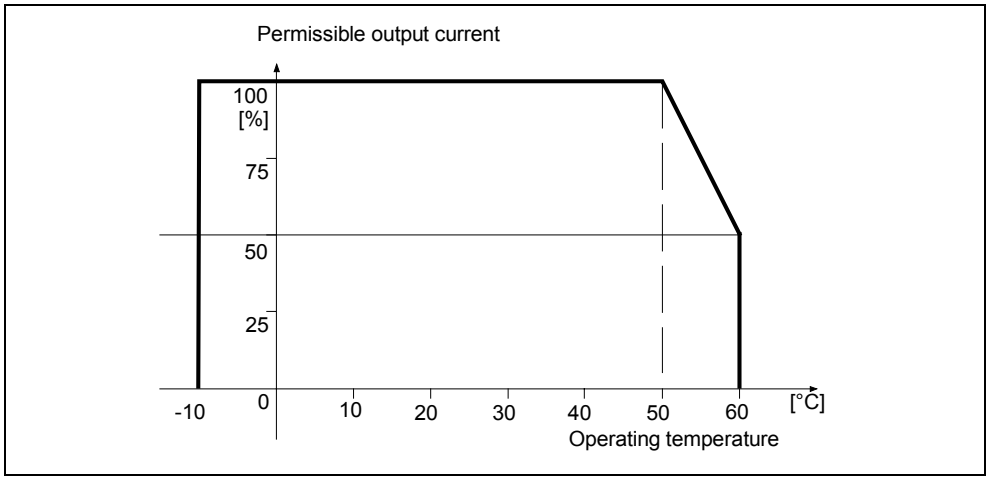


Figure 2-2 Ambient operating temperature

Humidity

Relative air humidity ≤ 95% Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000 m or > 2000 m above sea level, derating will be required:

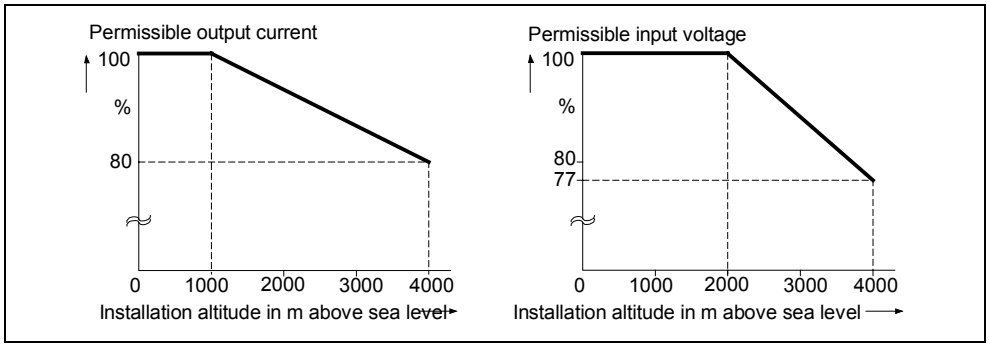


Figure 2-3 Installation altitude

Shock and Vibration

Do not drop the inverter or expose to sudden shock.. Do not install the inverter in an area where it is likely to be exposed to constant vibration.

Mechanical strength to DIN IEC 68-2-6

- Deflection: 0.075 mm (10 ... 58 Hz)
- Acceleration: 9.8 m/s^2 (> 58 ... 500 Hz)

Electromagnetic Radiation

Do not install the inverter near sources of electromagnetic radiation.

Atmospheric Pollution

Do not install the inverter in an environment, which contains atmospheric pollutants such as dust, corrosive gases, etc.

Water

Take care to site the inverter away from potential water hazards, e.g. do not install the inverter beneath pipes that are subject to condensation. Avoid installing the inverter where excessive humidity and condensation may occur.

Installation and cooling

CAUTION

The inverters MUST NOT be mounted horizontally.

The inverters can be mounted without any clearance at either side.

Allow 100 mm clearance above and below the inverter. Make sure that the cooling vents in the inverter are positioned correctly to allow free movement of air.

2.3 Mechanical installation

WARNING

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- The inverters can be mounted adjacent to each other. If they are mounted on top of each other, however, a clearance of 100 mm has to be observed.

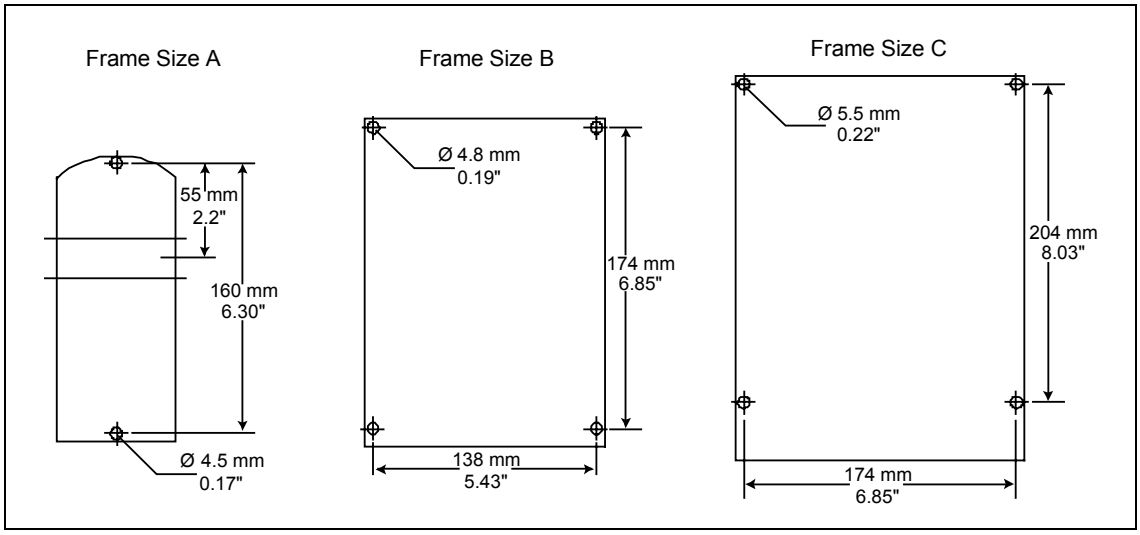


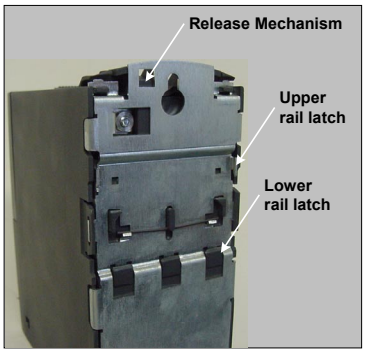
Figure 2-4 Drill pattern for MICROMASTER 420

Table 2-1 Dimensions and Torques of MICROMASTER 420

Frame-Size		Overall Dimensions		Fixing Method	Tightening Torque
A	Width x Height x Depth	mm	73 x 173 x 149	2 x M4 Bolts 2 x M4 Nuts 2 x M4 Washers for mounting on standard rail	2.5 Nm with washers fitted
		inch	2.87 x 6.81 x 5.87		
B	Width x Height x Depth	mm	149 x 202 x 172	4 x M4 Bolts 4 x M4 Nuts 4 x M4 Washers	2.5 Nm with washers fitted
		inch	5.87 x 7.95 x 6.77		
C	Width x Height x Depth	mm	185 x 245 x 195	4 x M5 Bolts 4 x M5 Nuts 4 x M5 Washers	2.5 Nm with washers fitted
		inch	7.28 x 9.65 x 7.68		

2.3.1 Mounting on standard rail, Frame Size A

Fitting the Inverter to a 35 mm standard rail (EN 50022)



1. Fit the inverter to the rail using the upper rail latch.

2. Push the inverter against the rail and the lower rail latch should click into place.

Removing the Inverter from the rail

1. To disengaged the release mechanism of the inverter, insert a screwdriver into the release mechanism.
2. Apply a downward pressure and the lower rail latch will disengage.
3. Pull the inverter from the rail.

2.4 Electrical installation

WARNING

The inverter must always be grounded.

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- Never use high voltage insulation test equipment on cables connected to the inverter.
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.

CAUTION

The control, power supply and motor leads **must** be laid separately. Do not feed them through the same cable conduit/trunking.

2.4.1 General

WARNING

The inverter must always be grounded. If the inverter is not grounded correctly, extremely dangerous conditions may arise within the inverter which could prove potentially fatal.

Operation with ungrounded (IT) supplies

The MICROMASTER will operate from ungrounded supplies and will continue to operate if an input phase is shorted to ground. If an output phase is shorted to ground, the MICROMASTER will trip and indicate F0001.

On ungrounded supplies, it will be necessary to remove the 'Y' capacitor from the inside of the unit and fit an output choke. The procedure for removing this capacitor is described in Appendices 0 and 0.

Operation with Residual Current Device

If an RCD (also referred to as ELCB or RCCB) is fitted, the MICROMASTER inverters will operate without nuisance tripping, provided that:

A type B RCD is used.
The trip limit of the RCD is 300mA.
The neutral of the supply is grounded.
Only one inverter is supplied from each RCD.
The output cables are less than 50m (screened) or 100m (unscreened).

Operation with long cables

All inverters will operate at full specification with cable lengths up to 50 m screened or 100 m unscreened.

2.4.2 Power and motor connections

WARNING

The inverter must always be grounded.

- Isolate the mains electrical supply before making or changing connections to the unit.
- Ensure that the motor is configured for the correct supply voltage: single / three-phase 230 V MICROMASTERS must not be connected to a 400 V three-phase supply.
- When synchronous motors are connected or when coupling several motors in parallel, the inverter must be operated with voltage/frequency control characteristic (P1300 = 0, 2 or 3).

CAUTION

After connecting the power and motor cables to the proper terminals, make sure that the covers have been replaced properly before supplying power to the unit!

NOTICE

- Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and inverter *(see chapter 7, Tables starting on page 77*).
- Use Class 1 60/75°C copper wire only (for UL compliance). For tightening torque see Table 7-2, page 76.

Access to the power and motor terminals

You can gain access to the mains and motor terminals by removing the covers (see also Appendices A, B und 0).

The mains and motor connections must be made as shown in Figure 2-6.

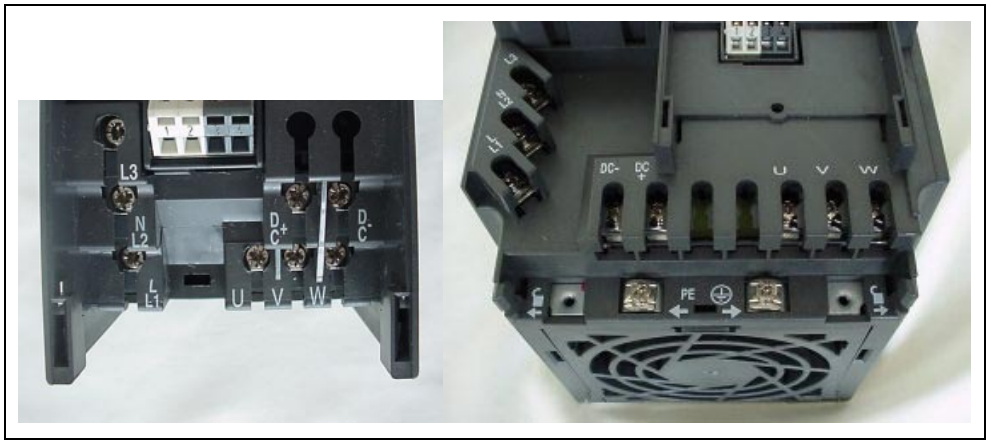


Figure 2-5 MICROMASTER 420 connection terminals

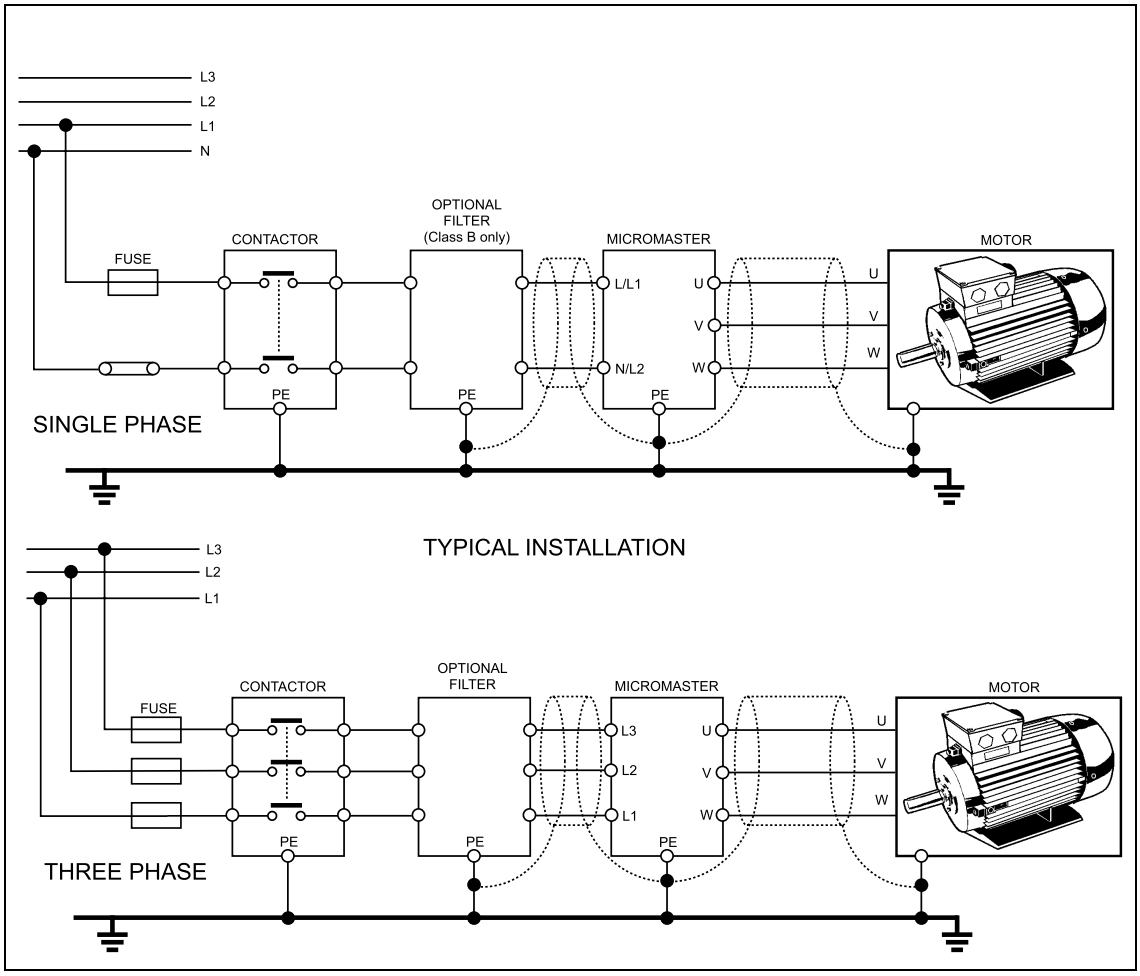


Figure 2-6 Motor and Power Connections

2.4.3 Avoiding Electro-Magnetic Interference (EMI)

The inverters are designed to operate in an industrial environment where a high level of EMI can be expected. Usually, good installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines stated below.

Action to Take

- Ensure that all equipment in the cubicle is well grounded using short, thick grounding cable connected to a common star point or busbar
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same ground or star point as the inverter via a short thick link.
- Connect the return ground from the motors controlled by the inverters directly to the ground connection (PE) on the associated inverter
- Flat conductors are preferred as they have lower impedance at higher frequencies
- Terminate the ends of the cable neatly, ensuring that unscreened wires are as short as possible
- **Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90º to each other.**
- Whenever possible, use screened leads for the connections to the control circuitry
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps

WARNING

Safety regulations **must not** be compromised when installing inverters!

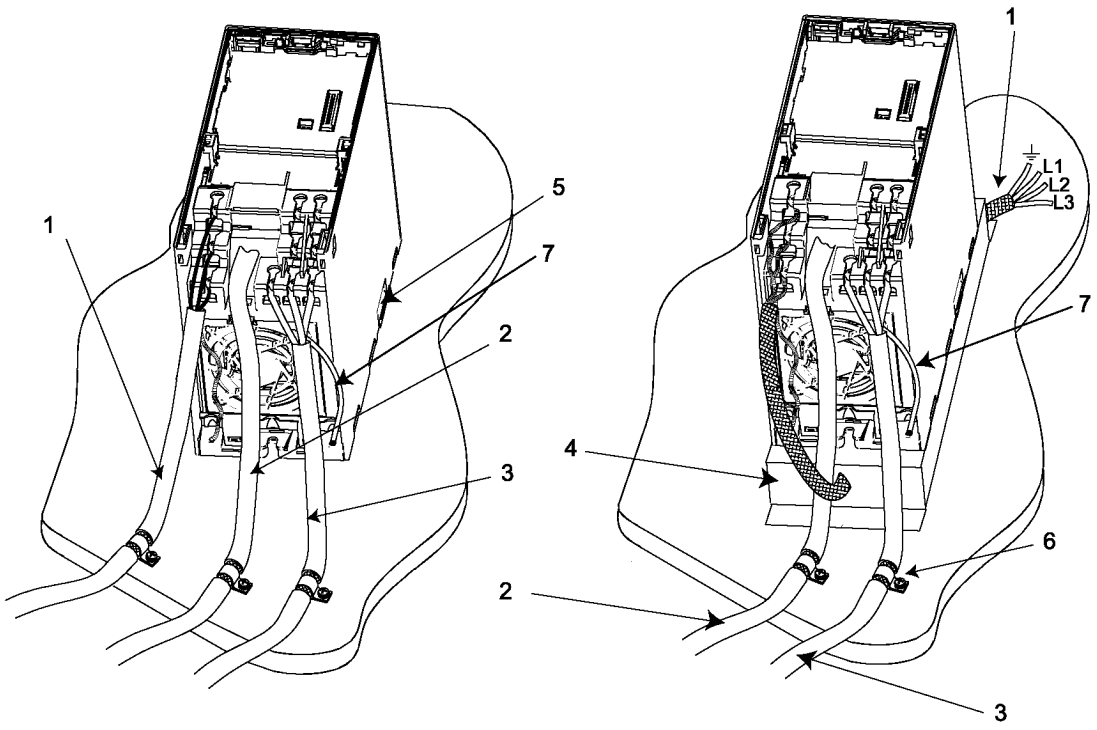
2.4.4 Screening Methods

Gland Plate

The Gland Plate Kit is supplied as an option. It allows easy and efficient connection of the necessary screening. See the Gland Plate Installation Instructions contained on the Docu-CD.

Screening without a Gland Plate

Should a Gland Plate not be available, then the inverter can be screened using the methodology shown in Figure 2-7.



1	Mains power input
2	Control cable
3	Motor cable
4	Footprint filter
5	Metal back plate
6	Use suitable clips to fix motor and control cable screens securely to metal back plate
7	Screening cables

Figure 2-7 Wiring Guidelines to Minimize the Effects of EMI

3 Commissioning

This Chapter contains:

- A schematic diagram of the MICROMASTER 420
- An overview of the commissioning options and the display and operator panels
- An overview of quick commissioing of the MICROMASTER 420

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WARNING

- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230/460V when protected by a time delay fuse (*see Tables starting on page 77).*
- This equipment must not be used as an ‘emergency stop mechanism’ *(see EN 60204, 9.2.5.4)*

CAUTION

Only qualified personnel may enter settings in the control panels. Particular attention must be paid to safety precautions and warnings at all times.

3.1 Block diagram

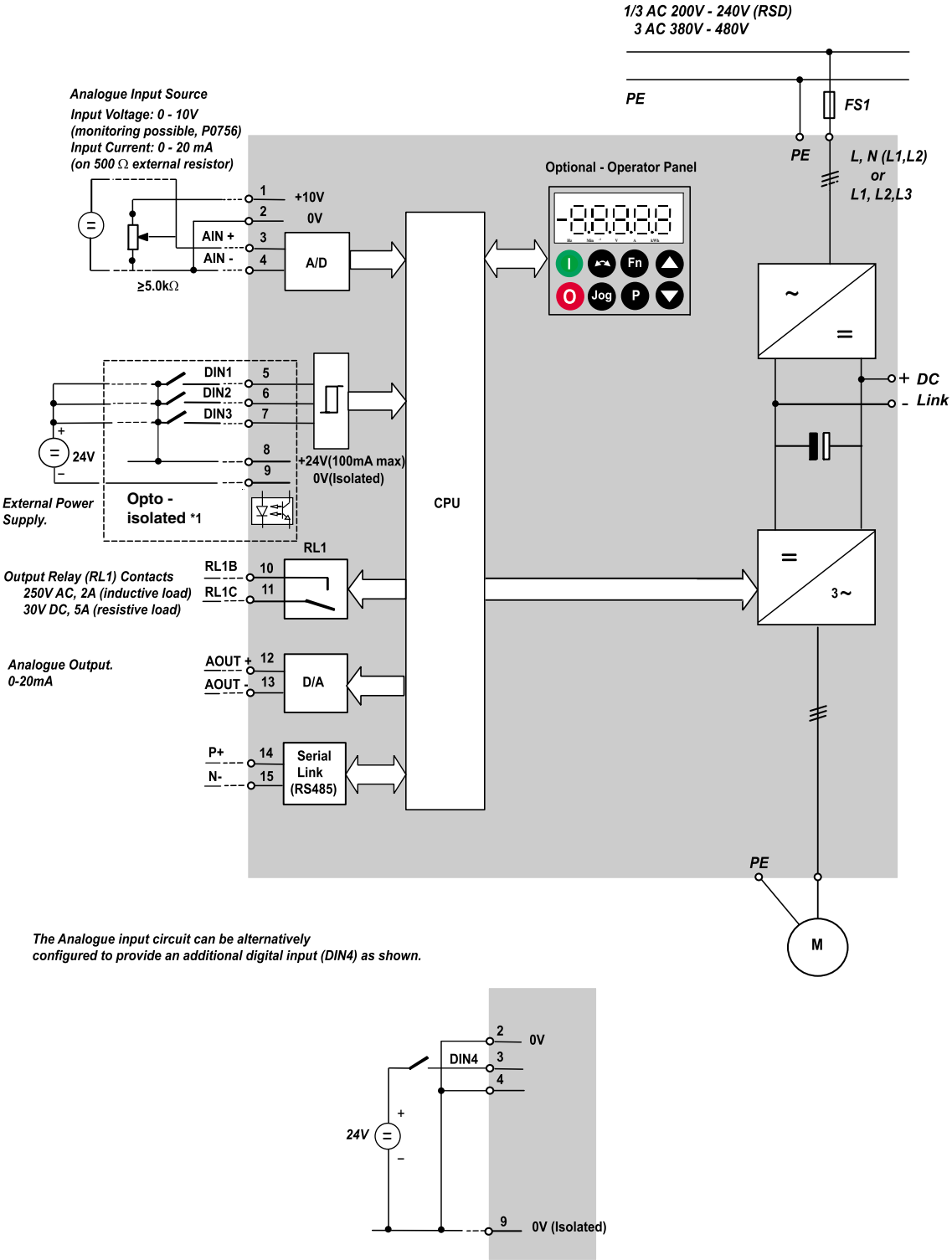


Figure 3-1 Inverter block diagram

3.2 Commission modes

In the standard version, the MICROMASTER 420 is fitted with the Status Display Panel (SDP) (see Figure 3-2) with which it is possible to use the inverter with the pre-assigned factory settings for a large range of applications. If these factory settings are not suitable, you can adapt them to suit your equipment conditions using the Basic Operator Panel (BOP) (see Figure 3-2) or the Advanced Operator Panel (AOP) (see Figure 3-2). The BOP and AOP are available as options. You can also adjust the factory settings using the PC IBN tool "Drive Monitor" or "STARTER". This software is available on the CD ROM which comes with the documentation of the unit.

SDP
Status Display Panel

BOP
Basic Operator Panel

AOP
Advanced Operator Panel

Figure 3-2 Panels available for the MICROMASTER 420 Inverter

For notes on replacing the operator panels please refer to the corresponding annexes A to this manual.

NOTICE

The default (factory value) frequency setting can be altered by means of theDIP switch under the SDP. The inverter is delivered as follows::

- DIP switch 2:
  - Off position:
    European defaults
    (50 Hz, kW usw.)
  - On position:
    North American defaults
    (60 Hz, hp usw.)
- DIP switch 1:
  Not for customer use.

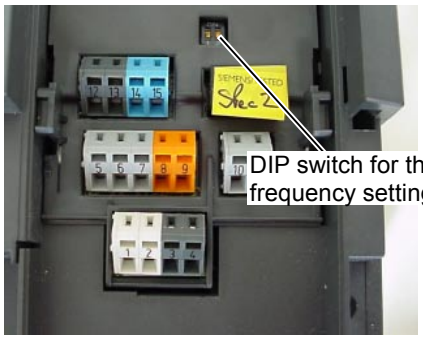
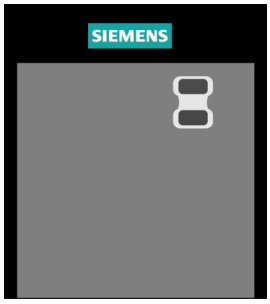


Figure 3-3 DIP switch

3.2.1 Commissioning and Operation with the SDP



The SDP has two LEDs on the front which display the current operating status of the inverter (see Section 6.1).

When the SDP is used, the presettings of the inverter must be compatible with the following motor data:

- Rated motor power
- Motor voltage
- Rated motor current
- Rated motor frequency

(A conventional Siemens motor is recommended)

In addition, the following conditions must be met:

- Linear V/f motor speed controlled by an analog potentiometer.
- Maximum speed 3000 rpm at 50 Hz (3600 rpm at 60 Hz); can be controlled by a potentiometer via the analog inputs of the inverter.
- Ramp acceleration time/ramp deceleration time = 10 s

Settings for more complex applications can be found in the parameter list and in Section 3.2.2 "Commission Overview with BOP or AOP".

Table 3-1 Default settings for operation using the SDP

	Terminals	**Parameter**	**Default Operating**
Digital Input 1	5	P0701 = ‘1’	ON right
Digital Input 2	6	P0702 = ‘12’	Reverse
Digital Input 3	7	P0703 = ‘9’	Fault Reset
Output Relay	10/11	P0731 = ’52.3’	Fault Identification
Analogue Output	12/13	P0771 = 21	Output Frequency
Analogue input	3/4	P0700 = 0	Frequency Setpoint
	1/2		Analog Input supply

Basic operation with SDP

With the **SDP** fitted, the following is possible:

- Start and stopping the motor
- Reversing the motor
- Fault Reset

Controlling the speed of the motor
Connect the terminals as shown in.Figure 3-4.

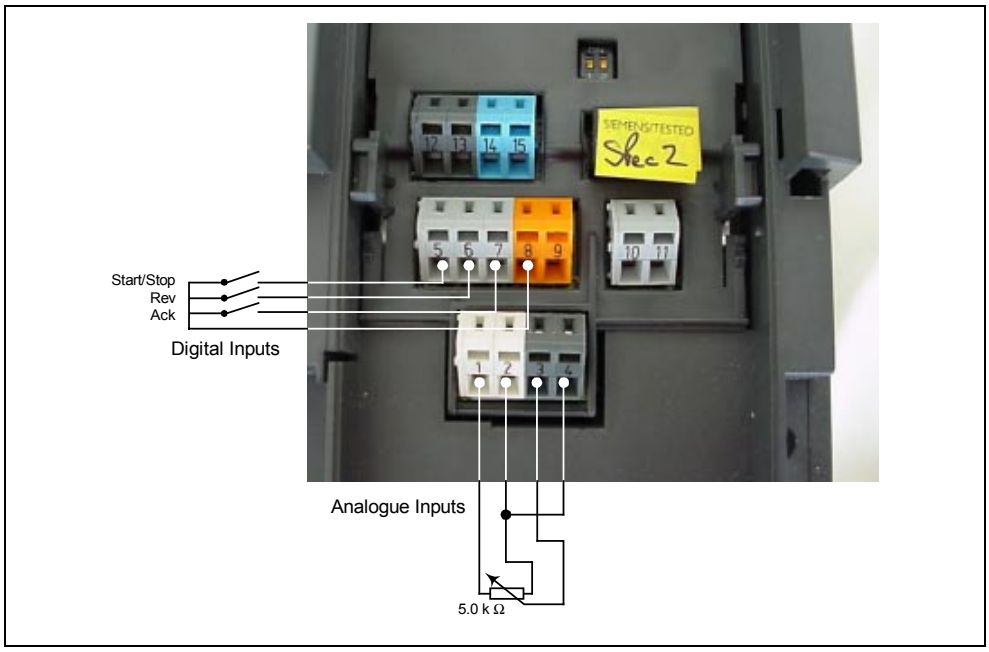
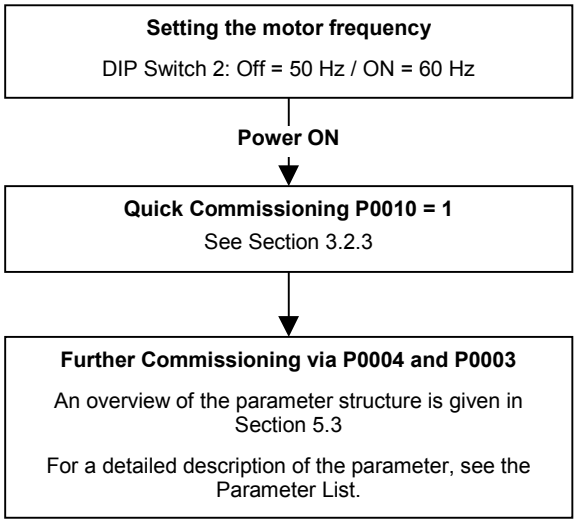


Figure 3-4 Basic operation with SDP

3.2.2 Commission Overview with BOP or AOP

Prerequisites

Mechanical and electrical Installation are completed.


Setting the motor frequency
DIP Switch 2: Off = 50 Hz / ON = 60 Hz
Power ON
Quick Commissioning P0010 = 1
See Section 3.2.3
Further Commissioning via P0004 and P0003
An overview of the parameter structure is given in Section 5.3
For a detailed description of the parameter, see the Parameter List.

NOTES

We recommend the commissioning according this scheme.

3.2.2.1 Commissioning with the BOP

You can alter parameter values via the BOP. To set parameters on this panel, you must remove the SDP and attach the BOP (see Appendix A).

The BOP features a five-digit, seven-segment display for showing parameter numbers and values, alarm and fault messages and setpoints and actual values. Parameter information cannot be saved via the BOP.

Table 3-2 shows the factory default settings for operation via the BOP.

NOTICE

- The BOP motor control functions are disabled by default. To control the motor via the BOP, parameter P0700 should be set to 1 and P1000 set to 1.
- The BOP can be fitted to and removed from the inverter whilst power is applied.
- If the BOP has been set as the I/O control (P0700 = 1), the drive will stop if the BOP is removed.

Table 3-2 Default settings for operation using the BOP

Parameter	Meaning	Default Europe (North America)
P0100	Operating Mode Europe/US	50 Hz, kW (60Hz, hp)
P0307	Power (rated motor)	kW (Hp)
P0310	Motor frequency rating	50 Hz (60 Hz)
P0311	Motor speed rating	1395 (1680) rpm [depending on variant]
P1082	Maximum Motor Frequency	50 Hz (60 Hz)

Buttons on the BOP

Panel/Button	Function	Effects
	Indicates Status	The LCD displays the settings currently used by the converter.
	Start converter	Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1.
	Stop converter	OFF1 Pressing the button causes the motor to come to a standstill at the selected ramp down rate. Disabled by default, to enable set P0700 = 1. OFF2 Pressing the button twice (or once long) causes the motor to coast to a standstill. This function is always enabled.
	Change direction	Press this button to change the direction of rotation of the motor. Reverse is indicated by a minus (-) sign or a flashing decimal point. Disabled by default, to enable set P0700 = 1.
	Jog motor	Pressing this button while the inverter has no output causes the motor to start and run at the preset jog frequency. The motor stops when the button is released. Pressing this button when the motor is running has no effect.
	Functions	This button can be used to view additional information. It works by pressing and holding the button. It shows the following, starting from any parameter during operation: 1. DC link voltage (indicated by d – units V). 2. output current. (A) 3. output frequency (Hz) 4. output voltage (indicated by o – units V). 5. The value selected in P0005 (If P0005 is set to show any of the above (3, 4, or 5) then this will not be shown again). Additional presses will toggle around the above displays. **Jump Function** From any parameter (rXXXX or PXXXX) a short press of the Fn button will immediately jump to r0000, you can then change another parameter, if required. Upon returning to r0000, pressing the Fn button will return you to your starting point.
	Access parameters	Pressing this button allows access to the parameters.
	Increase value	Pressing this button increases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.
	Decrease value	Pressing this button decreases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.

Figure 3-5 Buttons on the BOP

Changing parameters with the BOP

The procedure for changing the value of parameter P0004 is described below. Modifying the value of an indexed parameter is illustrated using the example of P0719. Follow exactly the same procedure to alter other parameters that you wish to set via the BOP.

Changing P0004 – parameter filter function

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P0004 is displayed	P0004
3	Press P to access the parameter value level	0
4	Press ▲ or ▼ to the required value	7
5	Press P to confirm and store the value	P0004
6	Only the command parameters are visible to the user.	

Changing P0719 an indexed parameter
Selection of command/setpoint source

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P0719 is displayed	P0719
3	Press P to access the parameter value level	in000
4	Press P to display current set value	0
5	Press ▲ or ▼ to the required value	12
6	Press P to confirm and store the value	P0719
7	Press ▼ until r0000 is displayed	r0000
8	Press P to return the display to the standard drive display (as defined by the customer)	

Figure 3-6 Changing parameters via the BOP

NOTES
In some cases - when changing parameter values - the display on the BOP shows P----. This means the inverter is busy with tasks of higher priority.

Changing single digits in Parameter values

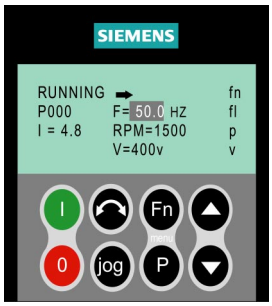
For changing the parameter value rapidly, the single digits of the display can be changed by performing the following actions:

Ensure you are in the parameter value changing level (see "Changing parameters with BOP").

1. Press Fn (function button), which causes the right hand digit to blink.
2. Change the value of this digit by pressing ▲ / ▼.
3. Press Fn (function button) again causes the next digit to blink.
4. Perform steps 2 to 4 until the required value is displayed.
5. Press the P to leave the parameter value changing level.

NOTES
The function button may also be used to acknowledge a fault condition

3.2.2.2 Commissioning with the AOP



The AOP is available as an option. Its advanced features include the following:

- Multilingual clear text display
- Upload/download of multiple parameter sets
- Programmable via PC
- Multidrop capability to drive up to 30 MICROMASTER 4's

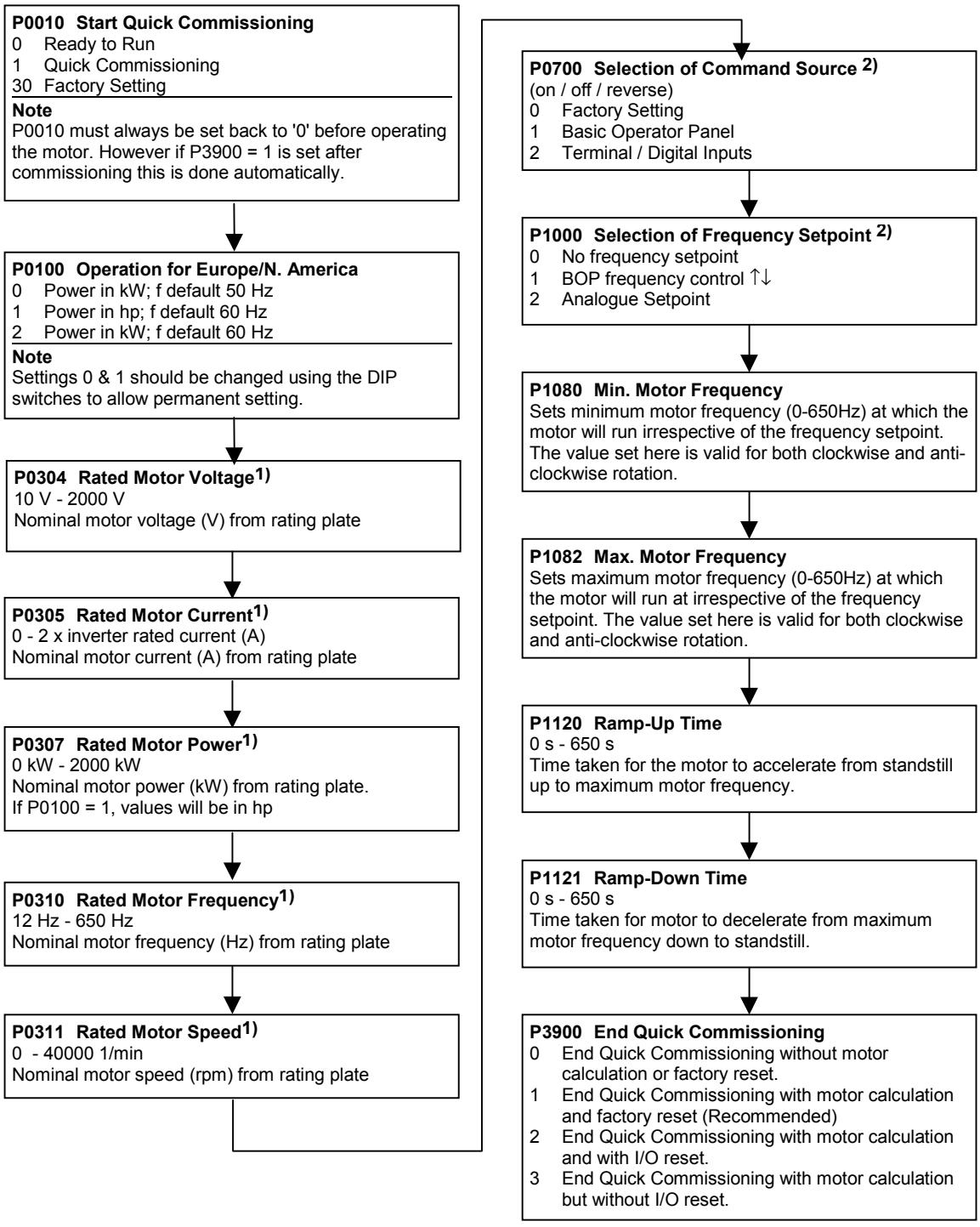
Please refer to the AOP Manual for details or contact your local Siemens sales office for assistance.

3.2.3 Commissioning functions with BOP / AOP

3.2.3.1 Quick commissioning (P0010=1)

It is **important** that parameter P0010 is used for commissioning and P0003 is used to select the number of parameters to be accessed. This parameter allows a group of parameters to be selected that will enable quick commissioning. Parameters such as Motor settings and Ramp settings are included. At the end of the quick commissioning sequence, P3900 should be selected, which, when set to 1, will carry out the necessary motor calculations and clear all other parameters (not included in P0010=1) to the default settings. This will only happen in the Quick Commissioning mode.

Flow chart Quick Commissioning (Level 1 Only)


P0010 Start Quick Commissioning
0 Ready to Run
1 Quick Commissioning
30 Factory Setting
Note
P0010 must always be set back to '0' before operating the motor. However if P3900 = 1 is set after commissioning this is done automatically.
P0100 Operation for Europe/N. America
0 Power in kW; f default 50 Hz
1 Power in hp; f default 60 Hz
2 Power in kW; f default 60 Hz
Note
Settings 0 & 1 should be changed using the DIP switches to allow permanent setting.
P0304 Rated Motor Voltage1)
10 V - 2000 V
Nominal motor voltage (V) from rating plate
P0305 Rated Motor Current1)
0 - 2 x inverter rated current (A)
Nominal motor current (A) from rating plate
P0307 Rated Motor Power1)
0 kW - 2000 kW
Nominal motor power (kW) from rating plate.
If P0100 = 1, values will be in hp
P0310 Rated Motor Frequency1)
12 Hz - 650 Hz
Nominal motor frequency (Hz) from rating plate
P0311 Rated Motor Speed1)
0 - 40000 1/min
Nominal motor speed (rpm) from rating plate
P0700 Selection of Command Source 2)
(on / off / reverse)
0 Factory Setting
1 Basic Operator Panel
2 Terminal / Digital Inputs
P1000 Selection of Frequency Setpoint 2)
0 No frequency setpoint
1 BOP frequency control ↑↓
2 Analogue Setpoint
P1080 Min. Motor Frequency
Sets minimum motor frequency (0-650Hz) at which the motor will run irrespective of the frequency setpoint. The value set here is valid for both clockwise and anti-clockwise rotation.
P1082 Max. Motor Frequency
Sets maximum motor frequency (0-650Hz) at which the motor will run at irrespective of the frequency setpoint. The value set here is valid for both clockwise and anti-clockwise rotation.
P1120 Ramp-Up Time
0 s - 650 s
Time taken for the motor to accelerate from standstill up to maximum motor frequency.
P1121 Ramp-Down Time
0 s - 650 s
Time taken for motor to decelerate from maximum motor frequency down to standstill.
P3900 End Quick Commissioning
0 End Quick Commissioning without motor calculation or factory reset.
1 End Quick Commissioning with motor calculation and factory reset (Recommended)
2 End Quick Commissioning with motor calculation and with I/O reset.
3 End Quick Commissioning with motor calculation but without I/O reset.

1) Motor-specific parameters – see motor rating plate.

2) The parameters offer more setting options than listed here. See Parameter List for further setting options.

Motor data for parameterization

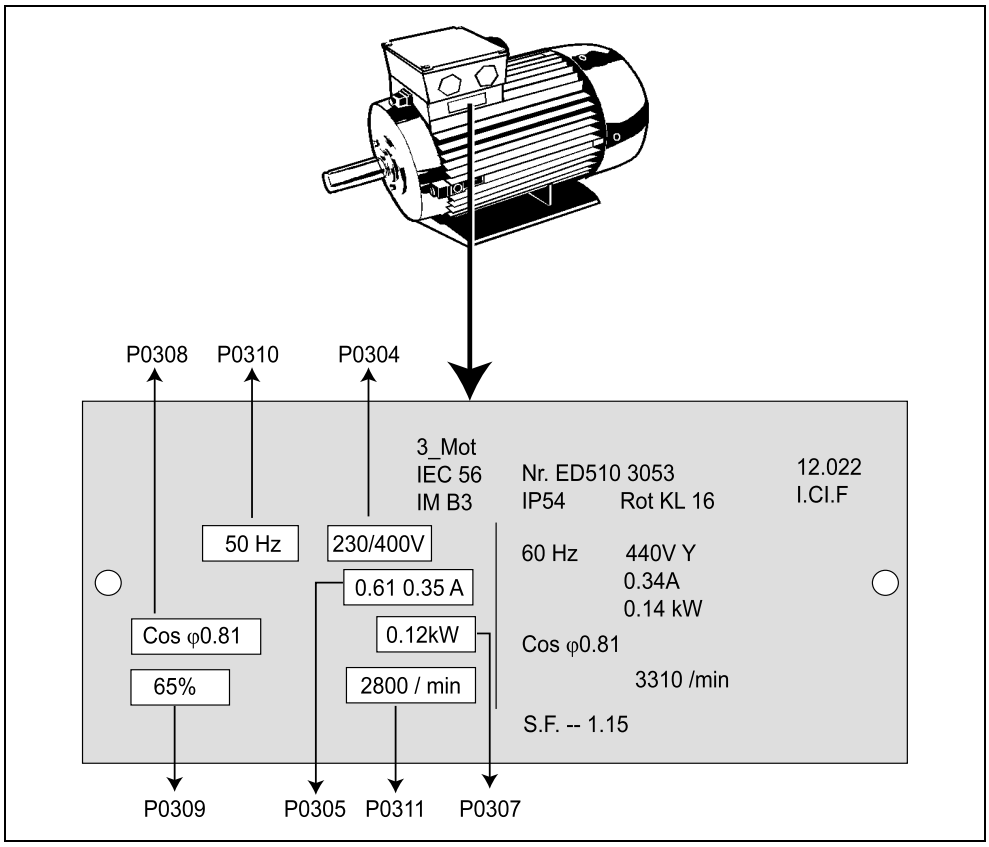


Figure 3-7 Typical Motor Rating Plate Example

NOTICE

- P0308 & P0309 are only visible if P0003 ≥ 2. Only one of the parameters are shown depending on the settings of P0100.
- P0307 indicates kW or HP depending upon the setting of P0100. For detailed information, please see the Parameter List.
- Changing motor parameters is not possible unless P0010=1.
- Ensure that the inverter is configured correctly to the motor, i.e. in the above example delta terminal connection is for 230 V.

3.2.3.2 Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows (BOP, AOP or Communication Option needed):

1. Set P0010 = 30
2. Set P0970 = 1

NOTE

The reset process can take up to 3 minutes to complete.

3.3 General operation

For a full description of standard and extended parameters, please refer to the Parameter List.

NOTICE

1. The inverter does not have a main power switch and is live when the mains supply is connected. It waits, with the output disabled, until the RUN button is pressed or for the presence of a digital ON signal at terminal 5 (rotate right).
2. If a BOP or an AOP is fitted and the output frequency is selected to be displayed (P0005 = 21) the corresponding setpoint is displayed approximately every 1.0 seconds while the inverter is stopped.
3. The inverter is programmed at the factory for standard applications on Siemens four-pole standard motors that have the same power rating as the inverters. When using other motors it is necessary to enter the specifications from the motor's rating plate. See Figure 3-7 for details on how to read motor data.
4. Changing motor parameters is not possible unless P0010 = 1.
5. You must set P0010 back to 0 in order to initiate a run.

Basic operation with the BOP/AOP

Prerequisites

P0010 = 0 (in order to initiate the run command correctly).
P0700 = 1 (enables the start/stop button on the BOP).
P1000 = 1 (this enables the motor potentiometer setpoints).

Press the green Button to start the motor.

Press the Button while the motor is turning. Motor speed increases to 50 Hz.

When the inverter reaches 50 Hz, press the Button . Motor speed and display is decreased.

Change the direction of rotation with the Button .

The red button stops the motor .

External motor thermal overload protection

When operated below rated speed, the cooling effect of fans fitted to the motor shaft is reduced. Consequentially, most motors require de-rating for continuous operation at low frequencies. To ensure that the motors are protected against overheating under these conditions, a PTC temperature sensor must be fitted to the motor and connected to the inverter control terminals. P0601 must also be set to 1.

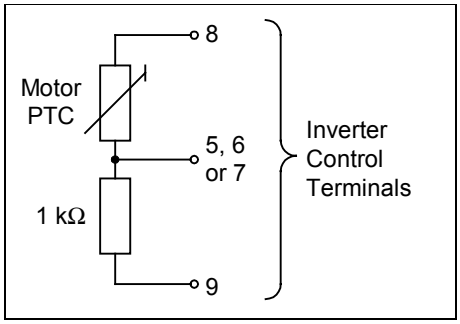


Figure 3-8 Motor Overload PTC Connection

NOTE

To enable the trip function, set parameter P0701, P0702 or P0703 = 29.

4 Using the MICROMASTER 420

This Chapter contains:

- An explanation of the various methods of controlling the inverter
- A summary of the types of control of the inverter

4.1 Frequency setpoint (P1000) 48
4.2 Command sources (P0700) 49
4.3 OFF and braking functions 49
4.4 Control modes (P1300) 50
4.5 Faults and warnings 51

WARNING

- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- MICROMASTERS operate at high voltages.
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10 000 symmetrical amperes (rms), for a maximum voltage of 230/460V when protected by a time delay fuse (*see Tables starting on page 77).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4).*

4.1 Frequency setpoint (P1000)

- Standard: Terminal 3/4 (AIN+/ AIN -, 0…10 V corresponds to 0…50/60 Hz)
- Options see P1000

NOTES

For USS see Reference Manual, for PROFIBUS see Reference Manual and Profibus Instructions.

4.2 Command sources (P0700)

NOTICE

The **ramp times** and **ramp-smoothing** functions also affect how the motor starts and stops. For details of these functions, please refer to parameters P1120, P1121, P1130 – P1134 in the Parameter List.

Starting the motor

- Standard Terminal 5 (DIN1, high)
- Options see P0700 to P0704

Stopping the motor

There are several ways to stop the motor:

- Standard:
  - OFF1 (4.3.1) Terminal 5 (DIN1, low)
  - OFF2 (4.3.2) Off button on BOP/AOP, pressing the Off button once long (two seconds) or twice (with default settings not possible without BOP/AOP)
  - OFF3 (4.3.3) Not active in the default (factory) setting
- Options see P0700 to P0704

Reversing the motor

- Standard Terminal 6 (DIN2, high)
- Options see P0700 to P0704

4.3 OFF and braking functions

4.3.1 OFF1

This command (produced by canceling the ON command) causes the inverter to come to a standstill at the selected ramp-down rate.

Parameter to change ramp time see P1121

NOTICE

- ON and the following OFF1 command must have the same source.
- If the ON/OFF1 command is set to more than one Digital input, only the last set Digital Input is number e.g. DIN3 is active.
- OFF1 can be combined with DC braking or Compound braking

4.3.2 OFF2

This command causes the motor to coast to a standstill.

NOTICE

The OFF2 command can have one or more sources. By default the OFF2 command is set to BOP/AOP. This source still exists even if other sources are defined by **one** of the following parameters, P0700, P0701, P0702, P0703 and P0704.

4.3.3 OFF3

An OFF3 command causes the motor to decelerate rapidly.

For starting the motor when OFF3 is set, the binary input has to be closed (high). If OFF3 is high, the motor can be started and stopped by OFF1 or OFF2.

If OFF3 is low the motor cannot be started.

- ramp down time: see P1135

NOTICE

OFF3 can be combined with DC braking or compound braking

4.3.4 DC braking

DC braking is possible together with OFF1 and OFF3. A DC current is applied to stop the motor quickly and hold the shaft stationary until the end of the braking period.

- set DC braking: see P0701 to P0704
- set braking period: see P1233
- set braking current: see P1232

NOTICE

If no digital input is set to DC braking and P1233 $\neq$ 0, DC braking will be active after every OFF1 command.

4.3.5 Compound Braking

Compound Braking is possible with both OFF1 and OFF3. For Compound Braking a DC component is added to the AC current.

set the braking current: see P1236

4.4 Control modes (P1300)

All control modes of the MICROMASTER 420 are based on a V/Hz control. The following different control variants are provided to suit different types of application:

- **Linear V/f control, P1300 = 0**
  Can be used for variable and constant torque applications, such as conveyors and positive displacement pumps.
- **Linear V/f control with Flux Current Control (FCC) P1300 = 1**
  This control mode can be used to improve the efficiency and dynamic response of the motor.
- **Quadratic V/f control P1300 = 2**
  This mode can be used for variable torque loads, such as fans and pumps.
- **Multi-point V/f control P1300 = 3**
  For information regarding this mode of operation, please consult the MM420 Reference Manual.

4.5 Faults and warnings

SDP

If an SDP is fitted, the fault states and warnings are indicated by the two LEDs on the panel, see section 6.1 on page 68 for further information.

Fault-free operation of the inverter is indicated by the following sequence of LED displays:

- Green and yellow = Ready to run
- Green = Run

BOP

If a BOP is installed, the last 8 fault conditions (P0947) and warnings (P2110) are displayed if a fault condition occurs. For further information, please refer to the Parameter List.

AOP

If the AOP is fitted, the fault and warning codes are displayed on the LCD panel.

5 System parameters

This Chapter contains:

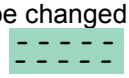
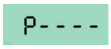
- An overview of the parameter structure of the MICROMASTER 420
- A parameter list in short form

5.1 Introduction to MICROMASTER system parameters 54
5.2 Parameter overview 55
5.3 Parameter list (short form) 56

5.1 Introduction to MICROMASTER system parameters

The parameters can only be changed by using the BOP, the Advance Operator Panel (AOP) or the Serial Interface.

Parameters can be changed and set using the BOP to adjust the desired properties of the inverter, such as ramp times, minimum and maximum frequencies etc. The parameter numbers selected and the setting of the parameter values are indicated on the optional five-digit LCD display.

- **r**xxxx indicates a display parameter, **P**xxxx a setting parameter.
- P0010 initiates “quick commissioning”.
- The inverter will not run unless P0010 is set to 0 after it has been accessed. This function is automatically perform if P3900 > 0.
- P0004 acts as a filter, allowing access to parameters according to their functionality.
- If an attempt is made to change a parameter that cannot be changed in this status, for example, cannot be changed whilst running or can only be changed in quick commissioning, then  will be displayed.
- **Busy Message**
  In some cases - when changing parameter values - the display on the BOP shows  for maximum of five seconds. This means the inverter is busy with tasks of higher priority.

5.1.1 Level

There are four levels of user access, Standard, Extended, Expert and Service selectable by parameter P0003. For most applications, Standard (P0003 = 1) or Extended parameters (P0003 = 2) are sufficient.

The number of parameters that appear within each functional group depends on the access level set in parameter P0003. For further details regarding parameters, see the Parameter List on the Documentation CD-ROM.

5.2 Parameter overview

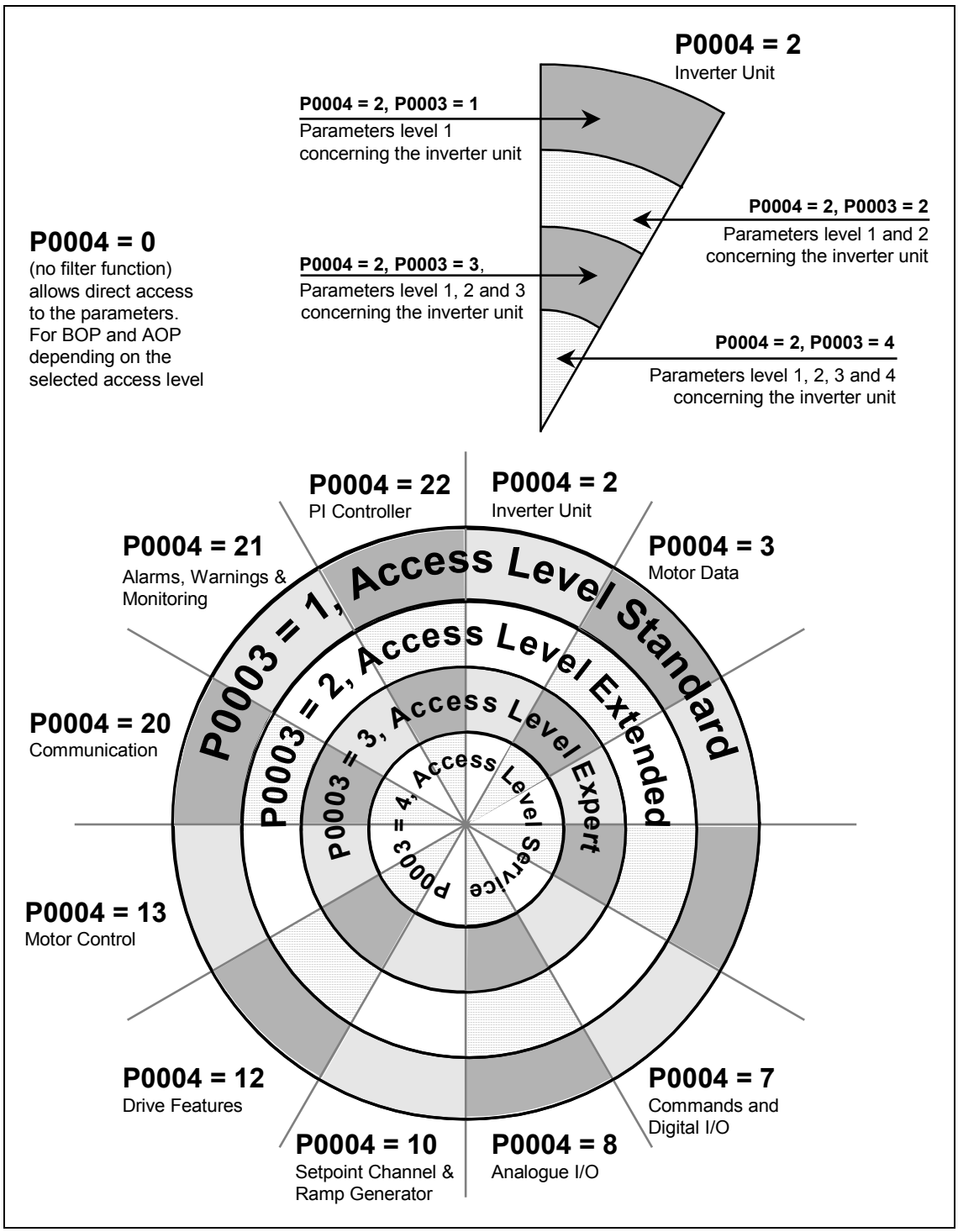


Figure 5-1 Parameter Overview

5.3 Parameter list (short form)

Explanatory information on following table:

- Default: Factory setting
- Level: Access level
- DS Inverter status (Drive State), indicates the inverter state in which a parameter can be modified (see P0010).
  - C Commissioning
  - U Run
  - T Ready to run
- QC Quick Commissioning
  - Q Parameter can be modified in the Quick Commissioning state.
  - N Parameter cannot be modified in the Quick Commissioning state.

Always

Par. No.	Parametername	Default	Acc	WS	QC
r0002	Drive state	-	2	-	-
P0003	User access level	1	1	CUT	-
P0004	Parameter filter	0	1	CUT	-
P0010	Commissioning parameter filter	0	1	CT	N
P3950	Access of hidden parameter	0	4	CUT	-

Quick Commissioning

Par.-No.	Parametername	Default	Level	WS	QC
P0100	Europe / North America	0	1	C	Q
P3900	End of quick commissioning	0	1	C	Q

Parameter Reset

Par.-No.	Parametername	Default	Level	WS	QC
P0970	Factory reset	0	1	C	-

Inverter Unit (P0004 = 2)

Par. No.	Parametername	Default	Acc	WS	QC
r0018	Firmware version	-	1	-	-
r0026	CO: Act. DC-link voltage	-	2	-	-
r0037[1]	CO: Drive temperatures	-	3	-	-
r0039	CO: Energy consumpt. meter [kWh]	-	2	-	-
P0040	Reset energy consumption meter	0	2	CT	-
r0200	Act. power stack code number	-	3	-	-
P0201	Power stack code number	0	3	C	-
r0203	Act. Power stack type	-	3	-	-
r0204	Power stack features	-	3	-	-
r0206	Rated inverter power [kW] or [hp]	-	2	-	-
r0207	Rated drive current	-	2	-	-
r0208	Supply voltage	-	2	-	-
P0210	Supply voltage	230	3	CT	-
r0231[2]	Max. cable length	-	3	-	-
P0290	Drive overload reaction	2	3	CT	-
P0291[1]	Config. Of inverter protection	1	3	CT	-
P0292	Drive overload warning	15	3	CUT	-
P0294	Drive I^2t overload warning	95.0	4	CUT	-
P1800	Switching frequency	4	2	CUT	-
r1801	CO: Act. switching frequency	-	3	-	-
P1802	Modulator mode	0	3	CUT	-
P1803[1]	Max. Modulation	106.0	4	CUT	-
P1820[1]	Reverse output phase sequence	0	2	CT	-
R3954[13]	CM version and GUI ID	-	4	-	-
P3980	Commissioning command Selection	-	4	T	-

Motor Data (P0004 = 3)

Par. No.	Parametername	Default	Acc	WS	QC
r0035[3]	CO: Act. motor temperature	-	2	-	-
P0300[1]	Select motor type	1	2	C	Q
P0304[1]	Rated motor voltage	230	1	C	Q
P0305[1]	Rated motor current	3.25	1	C	Q
P0307[1]	Rated motor power [kW] or [hp]	0.75	1	C	Q
P0308[1]	Rated motor cosPhi	0.000	2	C	Q
P0309[1]	Rated motor efficiency	0.0	2	C	Q
P0310[1]	Rated motor frequency	50.00	1	C	Q
P0311[1]	Rated motor speed	0	1	C	Q
r0313[1]	Motor pole pairs	-	3	-	-
P0320[1]	Motor magnetizing current	0.0	3	CT	Q
r0330[1]	Rated motor slip	-	3	-	-
r0331[1]	Rated magnetization current	-	3	-	-
r0332[1]	Rated power factor	-	3	-	-
P0335[1]	Motor cooling	0	2	CT	Q
P0340[1]	Calc motor model and control	0	2	CT	-
P0344[1]	Motor weight	9.4	3	CUT	-
P0346[1]	Magnetization time	1.000	3	CUT	-
P0347[1]	Demagnetization time	1.000	3	CUT	-
P0350[1]	Stator resistance (line-to-line)	4.0	2	CUT	-
r0370[1]	Stator resistance [%]	-	4	-	-
r0372[1]	Cable resistance [%]	-	4	-	-
r0373[1]	Rated stator resistance [%]	-	4	-	-
r0374[1]	Rotor resistance [%]	-	4	-	-
r0376[1]	Rated rotor resistance [%]	-	4	-	-
r0377[1]	Total leakage reactance [%]	-	4	-	-
r0382[1]	Main reactance	-	4	-	-
r0384[1]	Rotor time constant	-	3	-	-
r0386[1]	Total leakage time constant	-	4	-	-
r0395	Total stator resistance [%]	-	3	-	-
P0610	Motor I^2t temperature reaction	2	3	CT	-
P0611[1]	Motor I^2t time constant	100	2	CT	-
P0614[1]	Motor I^2t overload warning level	100.0	2	CUT	-
P0640[1]	Motor current limit	150.0	2	CUT	Q
P1910	Select motor data identification	0	2	CT	Q
r1912	Identified stator resistance	-	2	-	-

Commands and Digital I/O (P0004 = 7)

Par. No.	Parametername	Default	Acc	WS	QC
r0002	Drive state	-	2	-	-
r0019	CO/BO: BOP control word	-	3	-	-
r0052	CO/BO: Status word 1	-	2	-	-
r0053	CO/BO: Status word 2	-	2	-	-
r0054	CO/BO: Control word 1	-	3	-	-
r0055	CO/BO: Control word 2	-	3	-	-
P0700[1]	Selection of command source	2	1	CT	Q
P0701[1]	Selection of digital input 1	1	2	CT	-
P0702[1]	Selection of digital input 2	12	2	CT	-
P0703[1]	Selection of digital input 3	9	2	CT	-
P0704[1]	Selection of digital input 4	0	2	CT	-
P0719	Selection of cmd. & freq. setp.	0	3	CT	-
r0720	Number of digital inputs	-	3	-	-
r0722	CO/BO: Binary input values	-	2	-	-
P0724	Debounce time for digital inputs	3	3	CT	-
P0725	PNP / NPN digital inputs	1	3	CT	-
r0730	Number of digital outputs	-	3	-	-
P0731[1]	BI: Digital output	52:3	2	CUT	-
r0747	CO/BO: State of digital outputs	-	3	-	-
P0748	Invert digital outputs	0	3	CUT	-
P0800[1]	BI: Download parameter set 0	0:0	3	CT	-
P0801[1]	BI: Download parameter set 1	0:0	3	CT	-
P0840[1]	BI: ON/OFF1	722:0	3	CT	-
P0842[1]	BI: ON/OFF1 reverse	0:0	3	CT	-
P0844[1]	BI: 1. OFF2	1:0	3	CT	-
P0845[1]	BI: 2. OFF2	19:1	3	CT	-
P0848[1]	BI: 1. OFF3	1:0	3	CT	-
P0849[1]	BI: 2. OFF3	1:0	3	CT	-
P0852[1]	BI: Pulse enable	1:0	3	CT	-
P1020[1]	BI: Fixed freq. selection Bit 0	0:0	3	CT	-
P1021[1]	BI: Fixed freq. selection Bit 1	0:0	3	CT	-
P1022[1]	BI: Fixed freq. selection Bit 2	0:0	3	CT	-
P1035[1]	BI: Enable MOP (UP-command)	19:13	3	CT	-
P1036[1]	BI: Enable MOP (DOWN-command)	19:14	3	CT	-
P1055[1]	BI: Enable JOG right	0:0	3	CT	-
P1056[1]	BI: Enable JOG left	0:0	3	CT	-
P1074[1]	BI: Disable additional setpoint	0:0	3	CUT	-
P1110[1]	BI: Inhibit neg. freq. setpoint	0:0	3	CT	-
P1113[1]	BI: Reverse	722:1	3	CT	-
P1124[1]	BI: Enable JOG ramp times	0:0	3	CT	-
P1230[1]	BI: Enable DC braking	0:0	3	CUT	-
P2103[1]	BI: 1. Faults acknowledgement	722:2	3	CT	-
P2104[1]	BI: 2. Faults acknowledgement	0:0	3	CT	-
P2106[1]	BI: External fault	1:0	3	CT	-

Par. No.	Parametername	Default	Acc	WS	QC
P2220[1]	BI: Fixed PID setp. select Bit 0	0:0	3	CT	-
P2221[1]	BI: Fixed PID setp. select Bit 1	0:0	3	CT	-
P2222[1]	BI: Fixed PID setp. select Bit 2	0:0	3	CT	-
P2235[1]	BI: Enable PID-MOP (UP-cmd)	19:13	3	CT	-
P2236[1]	BI: Enable PID-MOP (DOWN-cmd)	19:14	3	CT	-

Analogue I/O (P0004 = 8)

Par. No.	Parametername	Default	Acc	WS	QC
r0750	Number of ADCs	-	3	-	-
r0751	CO/BO: Status word: ADC-channels	-	4	-	-
r0752[1]	Act. input of ADC [V]	-	2	-	-
P0753[1]	Smooth time ADC	3	3	CUT	-
r0754[1]	Act. ADC value after scaling [%]	-	2	-	-
r0755[1]	CO: Act. ADC after scal. [4000h]	-	2	-	-
P0756[1]	Type of ADC	0	2	CT	-
P0757[1]	Value x1 of ADC scaling	0	2	CUT	-
P0758[1]	Value y1 of ADC scaling	0.0	2	CUT	-
P0759[1]	Value x2 of ADC scaling	10	2	CUT	-
P0760[1]	Value y2 of ADC scaling	100.0	2	CUT	-
P0761[1]	Width of ADC deadband	0	2	CUT	-
P0762[1]	Delay for loss of signal action	10	3	CUT	-
r0770	Number of DACs	-	3	-	-
P0771[1]	CI: DAC	21:0	2	CUT	-
P0773[1]	Smooth time DAC	2	3	CUT	-
r0774[1]	Act. DAC value	-	2	-	-
r0776[1]	Type of DAC	0	3	CT	-
P0777[2]	Value x1 of DAC scaling	0.0	2	CUT	-
P0778[1]	Value y1 of DAC scaling	0	2	CUT	-
P0779[1]	Value x2 of DAC scaling	100.0	2	CUT	-
P0780[1]	Value y2 of DAC scaling	20	2	CUT	-
P0781[1]	Width of DAC deadband	0	2	CUT	-

Setpoint Channel and Ramp Generator (P0004 = 10)

Par. No.	Parametername	Default	Acc	WS	QC
P1000[1]	Selection of frequency setpoint	2	1	CT	Q
P1001	Fixed frequency 1	0.00	2	CUT	-
P1002	Fixed frequency 2	5.00	2	CUT	-
P1003	Fixed frequency 3	10.00	2	CUT	-
P1004	Fixed frequency 4	15.00	2	CUT	-
P1005	Fixed frequency 5	20.00	2	CUT	-
P1006	Fixed frequency 6	25.00	2	CUT	-
P1007	Fixed frequency 7	30.00	2	CUT	-
P1016	Fixed frequency mode - Bit 0	1	3	CT	-
P1017	Fixed frequency mode - Bit 1	1	3	CT	-
P1018	Fixed frequency mode - Bit 2	1	3	CT	-

Par. No.	Parametername	Default	Acc	WS	QC
r1024	CO: Act. fixed frequency	-	3	-	-
P1031[1]	Setpoint memory of the MOP	0	2	CUT	-
P1032	Inhibit reverse direction of MOP	1	2	CT	-
P1040[1]	Setpoint of the MOP	5.00	2	CUT	-
r1050	CO: Act. Output freq. of the MOP	-	3	-	-
P1058	JOG frequency right	5.00	2	CUT	-
P1059	JOG frequency left	5.00	2	CUT	-
P1060[1]	JOG ramp-up time	10.00	2	CUT	-
P1061[1]	JOG ramp-down time	10.00	2	CUT	-
P1070[1]	CI: Main setpoint	755:0	3	CT	-
P1071[1]	CI: Main setpoint scaling	1:0	3	T	-
P1075[1]	CI: Additional setpoint	0:0	3	CT	-
P1076[1]	CI: Additional setpoint scaling	1:0	3	T	-
r1078	CO: Total frequency setpoint	-	3	-	-
r1079	CO: Selected frequency setpoint	-	3	-	-
P1080	Min. frequency	0.00	1	CUT	Q
P1082	Max. frequency	50.00	1	CT	Q
P1091	Skip frequency 1	0.00	3	CUT	-
P1092	Skip frequency 2	0.00	3	CUT	-
P1093	Skip frequency 3	0.00	3	CUT	-
P1094	Skip frequency 4	0.00	3	CUT	-
P1101	Skip frequency bandwidth	2.00	3	CUT	-
r1114	CO: Freq. setp. after dir. ctrl.	-	3	-	-
r1119	CO: Freq. setpoint before RFG input	-	3	-	-
P1120[1]	Ramp-up time	10.00	1	CUT	Q
P1121[1]	Ramp-down time	10.00	1	CUT	Q
P1130[1]	Ramp-up initial rounding time	0.00	2	CUT	-
P1131[1]	Ramp-up final rounding time	0.00	2	CUT	-
P1132[1]	Ramp-down initial rounding time	0.00	2	CUT	-
P1133[1]	Ramp-down final rounding time	0.00	2	CUT	-
P1134[1]	Rounding type	0	2	CUT	-
P1135[1]	OFF3 ramp-down time	5.00	2	CUT	Q
P1140[1]	BI: RFG enable	1:0	4	CT	-
P1141[1]	BI: RFG start	1:0	4	CT	-
P1142[1]	BI: RFG enable setpoint	1:0	4	CT	-
r1170	CO: Frequency setpoint	-	3	-	-

Drive Features (P0004 = 12)

Par. No.	Parametername	Default	Acc	WS	QC
P0005	Display selection	21	2	CUT	-
P0006	Display mode	2	3	CUT	-
P0007	Backlight delay time	0	3	CUT	-
P0011	Lock for user defined parameter	0	3	CUT	-
P0012	Key for user defined parameter	0	3	CUT	-
P0013[20]	User defined parameter	0	3	CUT	-
P1200	Flying start enable	0	2	CUT	-
P1202[1]	Motor-current: Flying start	100	3	CUT	-
P1203[1]	Search rate: Flying start	100	3	CUT	-
P1204	Status word: Flying start	-	4	-	-
P1210	Automatic restart	1	2	CUT	-
P1211	Number of restart attempts	3	3	CUT	-
P1215	MHB function enable	0	2	T	-
P1216	MHB release delay	1.0	2	T	-
P1217	MHB holding time	1.0	2	T	-
P1232	Current of DC braking	100	2	CUT	-
P1233	Duration of DC braking	0	2	CUT	-
P1236	Compound braking current	0	2	CUT	-
P1240[1]	Configuration of Vdc controller	1	3	CT	-
r1242	CO: Switch-on level of Vdc-max	-	3	-	-
P1243[1]	Dynamic factor of Vdc-max	100	3	CUT	-
P1250[1]	Gain Vdc-controller	1.00	4	CUT	-
P1251[1]	Integration time Vdc-controller	40.0	4	CUT	-
P1252[1]	Differential time Vdc-controller	1.0	4	CUT	-
P1253[1]	Vdc-controller output limitation	10	3	CUT	-
P1254	Auto detect Vdc switch-on levels	1	3	CT	-

Motor Control (P0004 = 13)

Par. No.	Parametername	Default	Acc	WS	QC
r0020	CO: Act. frequency setpoint	-	3	-	-
r0021	CO: Act. frequency	-	2	-	-
r0022	Act. rotor speed	3	N	-	-
r0024	CO: Act. output frequency	-	3	-	-
r0025	CO: Act. output voltage	-	2	-	-
r0027	CO: Act. output current	-	2	-	-
r0034[1]	CO: Motor utilization	-	2	-	-
r0036	CO: Drive utilization	-	4	-	-
r0056	CO/BO: Status of motor control	-	2	-	-
r0067	CO: Act. drive current limit	-	3	-	-
r0071	CO: Max. output voltage	-	3	-	-
r0078	CO: Act. current Isq	-	4	-	-
r0084	CO: Act. Air gap flux	-	4	-	-
r0086	CO: Act. active current	-	3	-	-
P1300[1]	Control mode	1	2	CT	Q
P1310[1]	Continuous boost	50.0	2	CUT	-
P1311[1]	Acceleration boost	0.0	2	CUT	-
P1312[1]	Starting boost	0.0	2	CUT	-
r1315	CO: Total boost voltage	-	4	-	-
P1316[1]	Boost end frequency	20.0	3	CUT	-
P1320[1]	Programmable V/f freq. coord. 1	0.00	3	CT	-
P1321[1]	Programmable V/f volt. coord. 1	0.0	3	CUT	-
P1322[1]	Programmable V/f freq. coord. 2	0.00	3	CT	-
P1323[1]	Programmable V/f volt. coord. 2	0.0	3	CUT	-
P1324[1]	Programmable V/f freq. coord. 3	0.00	3	CT	-
P1325[1]	Programmable V/f volt. coord. 3	0.0	3	CUT	-
P1333	Start frequency for FCC	10.0	3	CUT	-
P1335	Slip compensation	0.0	2	CUT	-
P1336	Slip limit	250	2	CUT	-
r1337	CO: Slip frequency	-	3	-	-
P1338	Resonance damping gain V/f	0.00	3	CUT	-
P1340	Imax controller prop. gain	0.000	3	CUT	-
P1341	Imax controller integral time	0.300	3	CUT	-
r1343	CO: Imax controller freq. output	-	3	-	-
r1344	CO: Imax controller volt. output	-	3	-	-
P1350[1]	Voltage soft start	0	3	CUT	-

Communication (P0004 = 20)

Par. No.	Parametername	Default	Acc	WS	QC
P0918	CB bus address	3	2	CT	-
P0927	Parameter changeable via	15	2	CUT	-
r0964[5]	Firmware version data	-	3	-	-
r0967	Control word 1	-	3	-	-
r0968	Status word 1	-	3	-	-
P0971	Transfer data from RAM to EEPROM	0	3	CUT	-
P2000[1]	Reference frequency	50.00	2	CT	-
P2001[1]	Reference voltage	1000	3	CT	-
P2002[1]	Reference current	0.10	3	CT	-
P2009[2]	USS normalization	0	3	CT	-
P2010[2]	USS baudrate	6	2	CUT	-
P2011[2]	USS address	0	2	CUT	-
P2012[2]	USS PZD length	2	3	CUT	-
P2013[2]	USS PKW length	127	3	CUT	-
P2014[2]	USS telegram off time	0	3	CT	-
r2015[4]	CO: PZD from BOP link (USS)	-	3	-	-
P2016[4]	CI: PZD to BOP link (USS)	52:0	3	CT	-
r2018[4]	CO: PZD from COM link (USS)	-	3	-	-
P2019[4]	CI: PZD to COM link (USS)	52:0	3	CT	-
r2024[2]	USS error-free telegrams	-	3	-	-
r2025[2]	USS rejected telegrams	-	3	-	-
r2026[2]	USS character frame error	-	3	-	-
r2027[2]	USS overrun error	-	3	-	-
r2028[2]	USS parity error	-	3	-	-
r2029[2]	USS start not identified	-	3	-	-
r2030[2]	USS BCC error	-	3	-	-
r2031[2]	USS length error	-	3	-	-
r2032	BO: CtrlWrd1 from BOP link (USS)	-	3	-	-
r2033	BO: CtrlWrd2 from BOP link (USS)	-	3	-	-
r2036	BO: CtrlWrd1 from COM link (USS)	-	3	-	-
r2037	BO: CtrlWrd2 from COM link (USS)	-	3	-	-
P2040	CB telegram off time	0	3	CT	-
P2041[5]	CB parameter	0	3	CT	-
r2050[4]	CO: PZD from CB	-	3	-	-
P2051[4]	CI: PZD to CB	52:0	3	CT	-
r2053[5]	CB identification	-	3	-	-
r2054[7]	CB diagnosis	-	3	-	-
r2090	BO: Control word 1 from CB	-	3	-	-
r2091	BO: Control word 2 from CB	-	3	-	-

Alarms, Warnings and Monitoring (P0004 = 21)

Par. No.	Parametername	Default	Acc	WS	QC
r0947[8]	Fault number	-	2	-	-
r0948[12]	Fault time	-	3	-	-
R0949[8]	Fault value	-	4	-	-
P0952	Total number of faults	0	3	CT	-
P2100[3]	Alarm number stop reaction	0	3	CT	-
P2101[3]	Stop reaction value	0	3	CT	-
r2110[4]	Warning number	-	2	-	-
P2111	Total number of warnings	0	3	CT	-
r2114[2]	Run time counter	-	3	-	-
P2115[3]	AOP real time clock	0	3	CT	-
P2120	Indication counter	0	4	CUT	-
P2150[1]	Hysteresis frequency f,hys	3.00	3	CUT	-
P2155[1]	Threshold frequency f1	30.00	3	CUT	-
P2156[1]	Delay time f1	10	3	CUT	-
P2164[1]	Hysteresis frequency f,hysLeave	3.00	3	CUT	-
P2167[1]	Switch-off frequency f_off	1.00	3	CUT	-
P2168[1]	Delay time Toff (inverter switch-off)	10	3	CUT	-
P2170[1]	Threshold current I,thresh	100.0	3	CUT	-
P2171[1]	Delay time current	10	3	CUT	-
P2172[1]	Threshold voltage Vdc, thresh	800	3	CUT	-
P2173[1]	Delay time Vdc	10	3	CUT	-
P2179	Current limit for no load ident.	3.0	3	CUT	-
P2180	Delay time for no load ident.	2000	3	CUT	-
r2197	CO/BO: Status word 1 of monitor	-	2	-	-
P3981	Reset active fault	0	4	CT	-

PI Controller (P0004 = 22)

Par. No.	Parametername	Default	Acc	WS	QC
P2200[1]	BI: Enable PID controller	0:0	2	CT	-
P2201	Fixed PID setpoint 1	0.00	2	CUT	-
P2202	Fixed PID setpoint 2	10.00	2	CUT	-
P2203	Fixed PID setpoint 3	20.00	2	CUT	-
P2204	Fixed PID setpoint 4	30.00	2	CUT	-
P2205	Fixed PID setpoint 5	40.00	2	CUT	-
P2206	Fixed PID setpoint 6	50.00	2	CUT	-
P2207	Fixed PID setpoint 7	60.00	2	CUT	-
P2216	Fixed PID setpoint mode - Bit 0	1	3	CT	-
P2217	Fixed PID setpoint mode - Bit 1	1	3	CT	-
P2218	Fixed PID setpoint mode - Bit 2	1	3	CT	-
r2224	CO: Act. fixed PID setpoint	-	2	-	-
P2231[1]	Setpoint memory of PID-MOP	0	2	CUT	-
P2232	Inhibit rev. direct. of PID-MOP	1	2	CT	-
P2240[1]	Setpoint of PID-MOP	10.00	2	CUT	-
r2250	CO: Output setpoint of PID-MOP	-	2	-	-
P2253[1]	CI: PID setpoint	0:0	2	CUT	-
P2254[1]	CI: PID trim source	0:0	3	CUT	-
P2255	PID setpoint gain factor	100.00	3	CUT	-
P2256	PID trim gain factor	100.00	3	CUT	-
P2257	Ramp-up time for PID setpoint	1.00	2	CUT	-
P2258	Ramp-down time for PID setpoint	1.00	2	CUT	-
r2260	CO: Act. PID setpoint	-	2	-	-
P2261	PID setpoint filter timeconstant	0.00	3	CUT	-
r2262	CO: Act. PID filtered setpoint	-	3	-	-
P2264[1]	CI: PID feedback	755:0	2	CUT	-
P2265	PID feedback filter timeconstant	0.00	2	CUT	-
r2266	CO: PID feedback	-	2	-	-
P2267	Max. value for PID feedback	100.00	3	CUT	-
P2268	Min. value for PID feedback	0.00	3	CUT	-
P2269	Gain applied to PID feedback	100.00	3	CUT	-
P2270[1]	PID feedback function selector	0	3	CUT	-
P2271	PID tranducer type	0	2	CUT	-
r2272	CO: PID scaled feedback	-	2	-	-
r2273	CO: PID error	-	2	-	-
P2280	PID proportional gain	3.000	2	CUT	-
P2285	PID integral time	0.000	2	CUT	-
P2291	PID output upper limit	100.00	2	CUT	-
P2292	PID output lower limit	0.00	2	CUT	-
P2293	Ramp-up /-down time of PID limit	1.00	3	CUT	-
r2294	CO: Act. PID output	-	2	-	-

6 Troubleshooting

This Chapter contains:

- An overview of the operating statuses of the inverter with the SDP
- Notes on troubleshooting with the BOP
- A list of the alarms and fault messages

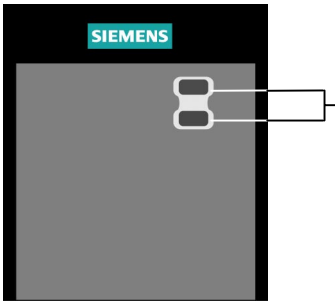
6.1 Troubleshooting with the 68
6.2 Troubleshooting with the BOP 69
6.3 MICROMASTER 420 fault messages 70

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

6.1 Troubleshooting with the SDP

Table 6-1 explains the meaning of the various states of the LEDs on the SDP.



LEDs for indicating the drive state
- Off
- On
- approx. 0,3 s, flashing
- approx. 1 s, twinkling

Table 6-1 Inverter conditions indicated by the LEDs on the SDP

● ●	Mains not present
☼ ☼	Ready to run
● ☼	Inverter fault - other than the ones listed below
☼ ●	Inverter running
● ◎	Fault overcurrent
◎ ●	Fault overvoltage
◎ ☼	Fault motor overtemperature
☼ ◎	Fault inverter temperature
◎ ◎	Warning current limit - both LEDs twinkling **same time**
◎ ◎	Other warnings - both LEDs twinkling **alternatively**
◎ ◎	Undervoltage trip / undervoltage warning
◎ ◎	Drive is not in ready state
◎ ◎	ROM failure - Both LEDs flashing **same time**
◎ ◎	RAM failure - Both LEDs flashing **alternatively**

6.2 Troubleshooting with the BOP

Warnings and faults are displayed on the BOP with Axxx and Fxxx respectively. The individual messages are shown in Section 6.3.

If the motor fails to start when the ON command has been given:

- Check that P0010 = 0.
- Check that a valid ON signal is present.
- Check that P0700 = 2 (for digital input control) or
  P0700 = 1 (for BOP control).
- Check that the setpoint is present (0 to 10V on Terminal 3) or the setpoint has been entered into the correct parameter, depending upon the setpoint source (P1000). See the Parameter List for further details.

If the motor fails to run after changing the parameters, set P0010 = 30 then P0970 = 1 and press **P** to reset the inverter to the factory default parameter values.

Now use a switch between terminals **5** and **8** on the control board. The drive should now run to the defined setpoint by analogue input.

NOTICE

Motor data must relate to the inverter data power range and voltage.

6.3 MICROMASTER 420 fault messages

In the event of a failure, the inverter switches off and a fault code appears on the display.

NOTE
To reset the fault code, one of three methods listed below can be used:

1. Cycle the power to the drive.
2. Press the Fn button on the BOP or AOP.
3. Via Digital Input 3 (default setting)

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0001 Overcurrent	➢ Motor power does not correspond to the inverter power ➢ Motor lead short circuit ➢ Earth fault	Check the following: 1. Motor power (P0307) must correspond to inverter power (P0206) 2. Cable length limits must not be exceeded 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Value of stator resistance (P0350) must be correct 6. Motor must not be obstructed or overloaded ➢ Increase the ramp time ➢ Reduce the boost level	OFF2
F0002 Overvoltage	➢ DC-link voltage (r0026) exceeds trip level (P2172) ➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode ➢ Regenerative mode can be cause by fast ramp downs or if the motor is driven from an active load	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. DC-link voltage controller must be enabled (P1240) and parameterized properly 3. Ramp-down time (P1121) must match inertia of load	OFF2
F0003 Undervoltage	➢ Main supply failed ➢ Shock load outside specified limits	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. Supply must not be susceptible to temporary failures or voltage reductions	OFF2
F0004 Inverter Over-temperature	➢ Ambient temperature outside of limits, ➢ Fan failure	Check the following: 1. Fan must turn when inverter is running 2. Pulse frequency must be set to default value 3. Air inlet and outlet points are not obstructed Ambient temperature could be higher than specified for the inverter	OFF2
F0005 Inverter I^2t	➢ Inverter overloaded ➢ Duty cycle too demanding ➢ Motor power (P0307) exceeds inverter power capability (P0206)	Check the following: 1. Load duty cycle must lie within specified limits 2. Motor power (P0307) must match inverter power (P0206)	OFF2
F0011 Motor Over-temperature I^2t	➢ Motor overloaded ➢ Motor data incorrect ➢ Long time period operating at low speeds	1. Check motor data 2. Check loading on motor 3. Boost settings too high (P1310,P1311, P1312) 4. Check parameter for motor thermal time constant 5. Check parameter for motor I^2t warning level	OFF1
F0041 Stator resistance measurement failure	Stator resistance measurement failure	1. Check if the motor is connected to the inverter 2. Check that the motor data has been entered correctly	OFF2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0051 Parameter EEPROM Fault	Reading or writing of the non-volatile parameter storage has failed	1. Factory reset and new parameterization 2. Change inverter	OFF2
F0052 Powerstack Fault	Reading of the powerstack information has failed or the data is invalid	Change inverter	OFF2
F0060 Asic Timeout	Internal communications failure	1. Acknowledge fault 2. Change inverter if repeated	OFF2
F0070 Communicatio ns board setpoint error	No setpoint received from communications board during telegram off time	1. Check connections to the communications board 2. Check the master	OFF2
F0071 No Data for USS (RS232 link) during Telegramm Off Time	No response during telegram off time via USS (BOP link)	1. Check connections to the communications board 2. Check the master	OFF2
F0072 No Data from USS (RS485 link) during Telegram Off Time	No response during telegram off time via USS (COM link)	1. Check connections to the communications board 2. Check the master	OFF2
F0080 Analogue input - lost input signal	➢ Broken wire ➢ Signal out of limits	Check connection to analogue input	OFF2
F0085 External Fault	External fault is triggered via terminal inputs	Disable terminal input for fault trigger	OFF2
F0101 Stack Overflow	Software error or processor failure	1. Run self test routines 2. Change inverter	OFF2
F0221 PI Feedback below mini-mum value	PID Feedback below minimum value P2268	1. Change value of P2268 2. Adjust feedback gain	OFF2
F0222 PI Feedback above maximum value	PID Feedback above maximum value P2267	1. Change value of P2267 2. Adjust feedback gain	OFF2
F0450 (Service mode only) **BIST Tests Failure**	Fault value 1 Some of the power section tests have failed 2 Some of the control board tests have failed 4 Some of the functional tests have failed 8 Some of the IO module tests have failed 16 The Internal RAM has failed its check on power-up	1. Inverter may run but certain actions will not function correctly 2. Replace inverter	OFF2

6.4 MICROMASTER 420 alarm messages

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too short ➢ Earth faults	1. Check whether the motor power corresponds to the inverter power 2. Check that the cable length limits have not been exceeded 3. Check motor cable and motor for short-circuits and earth faults 4. Check whether the motor parameters correspond with the motor being used 5. Check the stator resistance 6. Increase the ramp-up-time 7. Reduce the boost 8. Check whether the motor is obstructed or overloaded	--
A0502 Overvoltage limit	➢ Mains supply too high ➢ Load regenerative ➢ Ramp-down time too short	1. Check that mains supply voltage is within allowable range 2. Increase ramp down times **Note**: Vdc-max controller is active, ramp-down times will be automatically increased	--
A0503 Undervoltage Limit	➢ Mains supply too low ➢ Short mains interruption	Check main supply voltage (P0210)	--
A0504 Inverter Over-temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	1. Check if ambient temperature is within specified limits 2. Check load conditions and duty cycle 3. Check if fan is turning when drive is running	--
A0505 Inverter I^2t	Warning level is exceeded; current will be reduced if parameterized (P0610 = 1)	Check if duty cycle is within specified limits	--
A0506 Inverter Duty Cycle	Heatsink temperature and thermal junction model are outside of allowable range	Check if duty cycle are within specified limits	--
A0511 Motor Over-temperature I^2t	Motor overloaded	Check the following: 1. P0611 (motor i^2t time constant) should be set to appropriate value 2. P0614 (Motor i^2t overload warning level) should be set to suitable level 3. Are long periods of operation at low speed occuring 4. Check that boost settings are not too high	--
A0541 Motor Data Identification Active	Motor data identification (P1910) selected or running	Wait until motor identification is finished	--
A0600 RTOS Overrun Warning	Software error		
A0700 CB warning 1	CB (communication board) specific	See CB user manual	--
A0701 CB warning 2	CB (communication board) specific	See CB user manual	--
A0702 CB warning 3	CB (communication board) specific	See CB user manual	--
A0703 CB warning 4	CB (communication board) specific	See CB user manual	--
A0704 CB warning 5	CB (communication board) specific	See CB user manual	--
A0705 CB warning 6	CB (communication board) specific	See CB user manual	--

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0706 CB warning 7	CB (communication board) specific	See CB user manual	--
A0707 CB warning 8	CB (communication board) specific	See CB user manual	--
A0708 CB warning 9	CB (communication board) specific	See CB user manual	--
A0709 CB warning 10	CB (communication board) specific	See CB user manual	--
A0710 CB communication error	Communication with CB (communication board) is lost	Check CB hardware	--
A0711 CB configuration error	CB (communication board) reports a configuration error	Check CB parameters	--
A0910 Vdc-max controller deactivated	Vdc max controller has been deactivated, since controller is not capable of keeping DC-link voltage (r0026) within limits (P2172) ➢ Occurs if main supply voltage (P0210) is permanently too high ➢ Occurs if motor is driven by an active load, causing motor to goes into regenerative mode ➢ Occurs at very high load inertias, when ramping down	Check the following: 1. Input voltage (P0756) lies within range? 2. Load must match In certain cases apply braking resistor	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits (P2172)	1. Check parameter inverter input voltage 2. Check ramp-down times	--
A0912 Vdc-min controller active	Vdc min controller will be activated if DC-link voltage (r0026) falls below minimum level (P2172) ➢ The kinetic energy of the motor is used to buffer the DC-link voltage, thus causing deceleration of the drive! ➢ So short mains failures do not necessarily lead to an undervoltage trip		--
A0920 ADC parameters not set properly	ADC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for input do not correspond to ADC type	Analogue input parameters should not be set to the same value as each other	--
A0921 DAC parameters not set properly	DAC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for output do not correspond to DAC type	Analogue Output parameters should not be set to the same value as each other	--
A0922 No load applied to inverter	➢ No Load is applied to the inverter ➢ As a result, some functions may not work as under normal load conditions Low output voltage eg when 0 boost applied at 0 Hz	1. Check that load is applied to the inverter 2. Check motor parameters correspond to motor attached 3. As a result, some functions may not work correctly, because there is no normal load condition	--

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0923 Both JOG Left and JOG Right are requested	Both JOG right and JOG left (P1055/P1056) have been requested. This freezes the RFG output frequency at its current value. JOG right and JOG left signals active together	Make sure that JOG right and JOG left signals are not applied simultaneously	--

7 MICROMASTER 420 specifications

This Chapter contains:

- Table 7-1 contains the general technical specifications for the MICROMASTER 420 inverter
- Table 7-2 contains terminal tightening torques
- Table 7-3 includes various tables of specific technical data for individual MICROMASTER 420 inverters

Table 7-1 MICROMASTER Performance Ratings

Feature	Specification
Mains operating voltage and Power ranges	1 AC 200 V to 240 V ± 10 % 0,12 kW – 3,0 kW (0,16 hp – 4,0 hp) 3 AC 200 V to 240 V ± 10 % 0,12 kW – 5,5 kW (0,16 hp – 7,5 hp) 3 AC 380 V to 480 V ± 10 % 0,37 kW – 11,0 kW (0,50 hp – 15,0 hp)
Input frequency	47 Hz to 63 Hz
Output frequency	0 Hz to 650 Hz
Power factor	≥ 0,7
Inverter efficiency	96 % to 97 %
Overload capability	50 % overload capability for 60 s within 5 min period referred to the rated output current
Inrush current	Less than nominal input current
Control method	Linear V/f Control; Linear V/f with Flux Current Control (FCC), Quadratic V/f Control; Multi-point V/f control
Pulse frequency	2 kHz to 16 kHz (2 kHz steps)
Fixed frequencies	7, programmable
Skip frequencies	4, programmable
Setpoint resolution	0.01 Hz Digital, 0.01 Hz Serial, 10 bit Analogue (motor potentiometer 0.1 Hz [0.1% (in PID mode)])
Digital inputs	3, programmable (isolated), switchable active high / active low (PNP/NPN)
Analogue input	1, (0 to 10 V) used for frequency setpoint or PI feedback signal, scalable or usable as 4th digital input
Relay outputs	1, programmable 30 V DC / 5 A (resistive), 250 V AC / 2 A (inductive)
Analogue output	1, programmable (0 mA to 20 mA)
Serial interface	RS-485, Option RS-232
Electromagnetic compatibility	Optional EMC filters to EN55011 Class A or B, also Internal Class A filters available
Braking	DC braking, compound braking
Protection level	IP20
Temperature range	-10 °C to +50 °C (14 °F to 122 °F)
Storage temperature	-40 °C to +70 °C (-40 °F to 158 °F)
Humidity	< 95 % RH – non-condensing
Operational altitudes	up to 1000 m above sea level without derating
Protection features	Undervoltage , Overvoltage, Overload, Ground Faults, Short circuit, Stall Prevention, Motor Blocking Protection, Motor Overtemperature, Inverter Overtemperature, Parameter Interlock
Standards	UL, cUL, CE, C-tick
CE Marked	Conformity with EC Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC

Table 7-2 Tightening torques for power terminals

Frame size		A	B	C
Tightening torque	[Nm]	1.1	1.5	2.25
	[lbf.in]	10	13.3	20

Table 7-3 MICROMASTER 420 Specifications

In order to have a UL compliant installation fuses from the SITOR range with the appropriate current rating must be used.

Input voltage range 1 AC 200 V – 240 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AB11-2AA0	2AB12-5AA0	2AB13-7AA0	2AB15-5AA0	2AB17-5AA0	2AB21-1BA0	2AB21-5BA0	2AB22-2BA0	2AB23-0CA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	[kVA]	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	[A]	0.9	1.7	2.3	3.0	3.9	5.5	7.4	10.4	13.6
Input Current	[A]	2	4	5.5	7.5	9.9	14.4	19.6	26.4	35.5
Recommended Fuse	[A]	10	10	10	10	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3807	3NA3807	3NA3810	3NA3812
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	2.5	2.5	4.0	6.0
	[awg]	17	17	17	17	17	17	15	11	9
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	[kg]	1.2	1.2	1.2	1.3	1.3	3.3	3.6	3.6	5.2
	[lbs]	2.6	2.6	2.6	2.9	2.9	7.3	7.9	7.9	11.4
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range 3 AC 200 V – 240 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AC23-0CA0	2AC24-0CA0	2AC25-5CA0
Motor Output Rating	[kW]	3.0	4.0	5.5
	[hp]	4.0	5.0	7.5
Output Power	[kVA]	6.0	7.7	9.6
Output Current Max.	[A]	13.6	17.5	22.0
Input Current	[A]	15.6	19.7	26.3
Recommended Fuse	[A]	25	32	35
		3NA3810	3NA3812	3NA3814
Input Cable Min.	[mm^2]	2.5	2.5	4.0
	[awg]	13.0	13.0	11.0
Input Cable Max.	[mm^2]	10.0	10.0	10.0
	[awg]	7.0	7.0	7.0
Output Cable Min.	[mm^2]	1.5	2.5	4.0
	[awg]	15.0	13.0	11.0
Output Cable Max.	[mm^2]	10.0	10.0	10.0
	[awg]	7.0	7.0	7.0
Weight	[kg]	5.2	5.7	5.7
	[lbs]	11.4	12.5	12.5
Dimensions	w [mm]	185.0	185.0	185.0
	h [mm]	245.0	245.0	245.0
	d [mm]	195.0	195.0	195.0
	w [inches]	7.28	7.28	7.28
	h [inches]	9.65	9.65	9.65
	d [inches]	7.68	7.68	7.68

Input voltage range (Unfiltered) **1 AC / 3 AC 200 V – 240 V, ± 10 %**

Order No.	6SE6420-	2UC11 -2AA0	2UC12 -5AA0	2UC13 -7AA0	2UC15 -5AA0	2UC17 -5AA0	2UC21 -1BA0	2UC21 -5BA0	2UC22 -2BA0	2UC23 -0CA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	[kVA]	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	[A]	0.9	1.7	2.3	3	3.9	5.5	7.4	10.4	13.6
Input Current, 3 AC	[A]	0.7	1.7	2.4	3.1	4.3	6.2	8.3	11.3	15.6
Recommended Fuse	[A]	10	10	10	10	10	16	16	20	25
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3805	3NA3807	3NA3810
Input Current, 1 AC	[A]	2	4	5.5	7.5	9.9	14.4	19.6	26.4	35.5
Recommended Fuse	[A]	10	10	10	10	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3807	3NA3807	3NA3810	3NA3812
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.5
	[awg]	17	17	17	17	17	17	17	17	13
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	[kg]	1.2	1.2	1.2	1.2	1.2	2.9	2.9	3.1	5.2
	[lbs]	2.6	2.6	2.6	2.6	2.6	6.4	6.4	6.8	11.4
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range (Unfiltered) **3 AC 200 V – 240 V, ± 10 %**

Order No.	6SE6420-	2UC24-0CA0	2UC25-5CA0
Motor Output Rating	[kW]	4.0	5.5
	[hp]	5.0	7.5
Output Power	[kVA]	7.7	9.6
Output Current Max.	[A]	17.5	22
Input Current	[A]	19.7	26.3
Recommended Fuse	[A]	32	35
		3NA3812	3NA3814
Input Cable Min.	[mm^2]	2.5	4.0
	[awg]	13.0	11.0
Input Cable Max.	[mm^2]	10.0	10.0
	[awg]	7.0	7.0
Output Cable Min.	[mm^2]	2.5	4.0
	[awg]	13.0	11.0
Output Cable Max.	[mm^2]	10.0	10.0
	[awg]	7.0	7.0
Weight	[kg]	5.5	5.5
	[lbs]	12.1	12.1
Dimensions	w [mm]	185.0	185.0
	h [mm]	245.0	245.0
	d [mm]	195.0	195.0
	w [inches]	7.28	7.28
	h [inches]	9.65	9.65
	d [inches]	7.68	7.68

Input voltage range 3 AC 380 V – 480 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AD22-2BA0	2AD23-0BA0	2AD24-0BA0	2AD25-5CA0	2AD27-5CA0	2AD31-1CA0
Motor Output Rating	[kW]	2.2	3.0	4.0	5.5	7.5	11.0
	[hp]	3.0	4.0	5.0	7.5	10.0	15.0
Output Power	[kVA]	4.5	5.9	7.8	10.1	14.0	19.8
Output Current Max.	[A]	5.9	7.7	10.2	13.2	18.4	26.0
Input Current	[A]	7.5	10	12.8	17.3	23.1	33.8
Recommended Fuse	[A]	16	16	20	20	25	35
		3NA3805	3NA3805	3NA3807	3NA3807	3NA3810	3NA3814
Input Cable Min.	[mm^2]	1.0	1.0	1.5	2.5	4.0	6.0
	[awg]	17	17	15	13	11	9
Input Cable Max.	[mm^2]	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	9	9	9	7	7	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	15	13	11
Output Cable Max.	[mm^2]	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	9	9	9	7	7	7
Weight	[kg]	3.1	3.3	3.3	5.4	5.7	5.7
	[lbs]	6.8	7.3	7.3	11.9	12.5	12.5
Dimensions	w [mm]	149.0	149.0	149.0	185.0	185.0	185.0
	h [mm]	202.0	202.0	202.0	245.0	245.0	245.0
	d [mm]	172.0	172.0	172.0	195.0	195.0	195.0
	w [inches]	5.87	5.87	5.87	7.28	7.28	7.28
	h [inches]	7.95	7.95	7.95	9.65	9.65	9.65
	d [inches]	6.77	6.77	6.77	7.68	7.68	7.68

Input voltage range (Unfiltered) **3 AC 380 V – 480 V, ± 10 %**

Order No.	6SE6420-	2UD13 -7AA0	2UD15 -5AA0	2UD17 -5AA0	2UD21 -1AA0	2UD21 -5AA0	2UD22 -2BA0	2UD23 -0BA0	2UD24 -0BA0	2UD25 -5CA0	2UD27 -5CA0	2UD31 -1CA0
Motor Output Rating	[kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5	11.0
	[hp]	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	7.5	10.0	15.0
Output Power	[kVA]	0.9	1.2	1.6	2.3	3.0	4.5	5.9	7.8	10.1	14.0	19.8
Output Current Max.	[A]	1.2	1.6	2.1	3.0	4.0	5.9	7.7	10.2	13.2	18.4	26.0
Input Current	[A]	1.6	2.1	2.8	4.2	5.8	7.5	10.0	12.8	17.3	23.1	33.8
Recommended Fuse	[A]	10	10	10	10	10	16	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3805	3NA3807	3NA3807	3NA3810	3NA3814
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0	6.0
	[awg]	17	17	17	17	17	17	17	15	13	11	9
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7	7	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	17	17	17	17	17	15	13	11
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7	7	7
Weight	[kg]	1.3	1.3	1.3	1.3	1.3	3.1	3.3	3.3	5.2	5.5	5.5
	[lbs]	2.9	2.9	2.9	2.9	2.9	6.8	7.3	7.3	11.4	12.1	12.1
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0	185.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0	245.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0	195.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28	7.28	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65	9.65	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68	7.68	7.68

8 Options

An overview of the options available for the MICROMASTER 420 is given in this section. For further information about options, please refer to the catalog or the documentation CD.

8.1 Device-independent options

- Basic Operator Panel (BOP)
- Advanced Operator Panel (AOP)
- PROFIBUS module
- PC to inverter connection kit
- PC to AOP connection kit
- BOP/AOP door mounting kit for single inverter control
- AOP door mounting kit for multiple inverter control
- “DriveMonitor” and "Starter" commissioning tool

8.2 Device-dependent options

- EMC filter, Class A
- EMC filter, Class B
- Additional EMC filter, Class B
- Low leakage Class B filter
- Line commutating choke
- Output choke
- Gland plate

9 Electro-magnetic compatibility (EMC)

This Chapter contains:

EMC information.

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9.1 Electro-magnetic compatibility (EMC)

All manufacturers / assemblers of electrical apparatus which “performs a complete intrinsic function and is placed on the market as a single unit intended for the end user” must comply with the EMC directive 89/336/EEC.

There are three routes for the manufacturer/assembler to demonstrate compliance:

9.1.1 Self-certification

This is a manufacturer's declaration that the European standards applicable to the electrical environment for which the apparatus is intended have been met. Only standards that have been officially published in the Official Journal of the European Community can be cited in the manufacturer's declaration.

9.1.2 Technical construction file

A technical construction file can be prepared for the apparatus describing its EMC characteristics. This file must be approved by a ‘Competent Body’ appointed by the appropriate European government organization. This approach allows the use of standards that are still in preparation.

9.1.3 EC type examination certificate

This approach is only applicable to radio communication transmitting apparatus. All MICROMASTER units are certified for compliance with the EMC directive, when installed in accordance with the recommendations in Section 2.

9.1.4 EMC Directive Compliance with Imminent Harmonics Regulations

From 1st January 2001 all electrical apparatus covered by the EMC Directive will have to comply with EN 61000-3-2 "Limits for harmonic current emissions (equipment input ≤ 16 A per phase)".

All Siemens variable speed drives of the MICROMASTER, MIDIMASTER, MICROMASTER Eco and COMBIMASTER ranges, which are classified as "Professional Equipment" within the terms of the standard, fulfill the requirements of the standard.

Special considerations for 250 W to 550 W drives with 230 V 1ac mains supplies when used in non-industrial applications

Units in this voltage and power range will be supplied with the following warning: *"This equipment requires supply authority acceptance for connection to the public supply network*". Please refer to EN 61000-3-12 sections 5.3 and 6.4 for further information. Units connected to Industrial Networks[1] do not require connection approval (see EN 61800-3, section 6.1.2.2).

The harmonic current emissions from these products are described in the table below:

Table 9-1 Permissible harmonic current emissions

Rating	**Typical Harmonic Current (A)**					**Typical Harmonic Current (%)**					**Typical Voltage Distortion**		
											Distribution Transformer Rating		
											10 kVA	100 kVA	1 MVA
	3rd	5th	7th	9th	11th	3rd	5th	7th	9th	11th	THD (%)	THD (%)	THD (%)
250 W 1AC 230 V	2.15	1.44	0.72	0.26	0.19	83	56	28	10	7	0.77	0.077	0.008
370 W 1AC 230 V	2.96	2.02	1.05	0.38	0.24	83	56	28	10	7	1.1	0.11	0.011
550 W 1AC 230 V	4.04	2.70	1.36	0.48	0.36	83	56	28	10	7	1.5	0.15	0.015

The allowed harmonic currents for "professional equipment" with an input power > 1 kW are not yet defined. Therefore, any electrical apparatus containing the above drives which has an input power > 1 kW will not require connection approval.

Alternatively, the necessity to apply for connection approval can be avoided by fitting the input chokes recommended in the technical catalogues (except 550 W 230 V 1ac units).

1 Industrial Networks are defined as those which do not supply buildings used for domestic purposes.

9.1.5 Classification of EMC performance

Three General classes of EMC performance are available as detailed below:

Class 1: General Industrial

Compliance with the EMC Product Standard for Power Drive Systems EN 68100-3 for use in **Second Environment (Industrial)** and **Restricted Distribution**.

Table 9-2 Class 1 - General Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 68100-3	Limits under consideration
Immunity:		
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 1 kV control
Radio Frequency Electromagnetic Field	IEC 1000-4-3	26-1000 MHz, 10 V/m

Class 2: Filtered Industrial

This level of performance will allow the manufacturer/assembler to self-certify their apparatus for compliance with the EMC directive for the industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the Generic Industrial Emissions and Immunity standards EN 50081-2 and EN 50082-2.

Table 9-3 Class 2 - Filtered Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 55011	Level A1
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

Class 3: Filtered - for residential, commercial and light industry

This level of performance will allow the manufacturer / assembler to self-certify compliance of their apparatus with the EMC directive for the residential, commercial and light industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the generic emission and immunity standards EN 50081-1 and EN 50082-1.

Table 9-4 Class 3 - Filtered for Residential, Commercial and Light Industry

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions*	EN 55011	Level B
Conducted Emissions	EN 55011	Level B
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

* These limits are dependent on the inverter being correctly installed inside a metallic switchgear enclosure. The limits will not be met if the inverter is not enclosed.

NOTICE

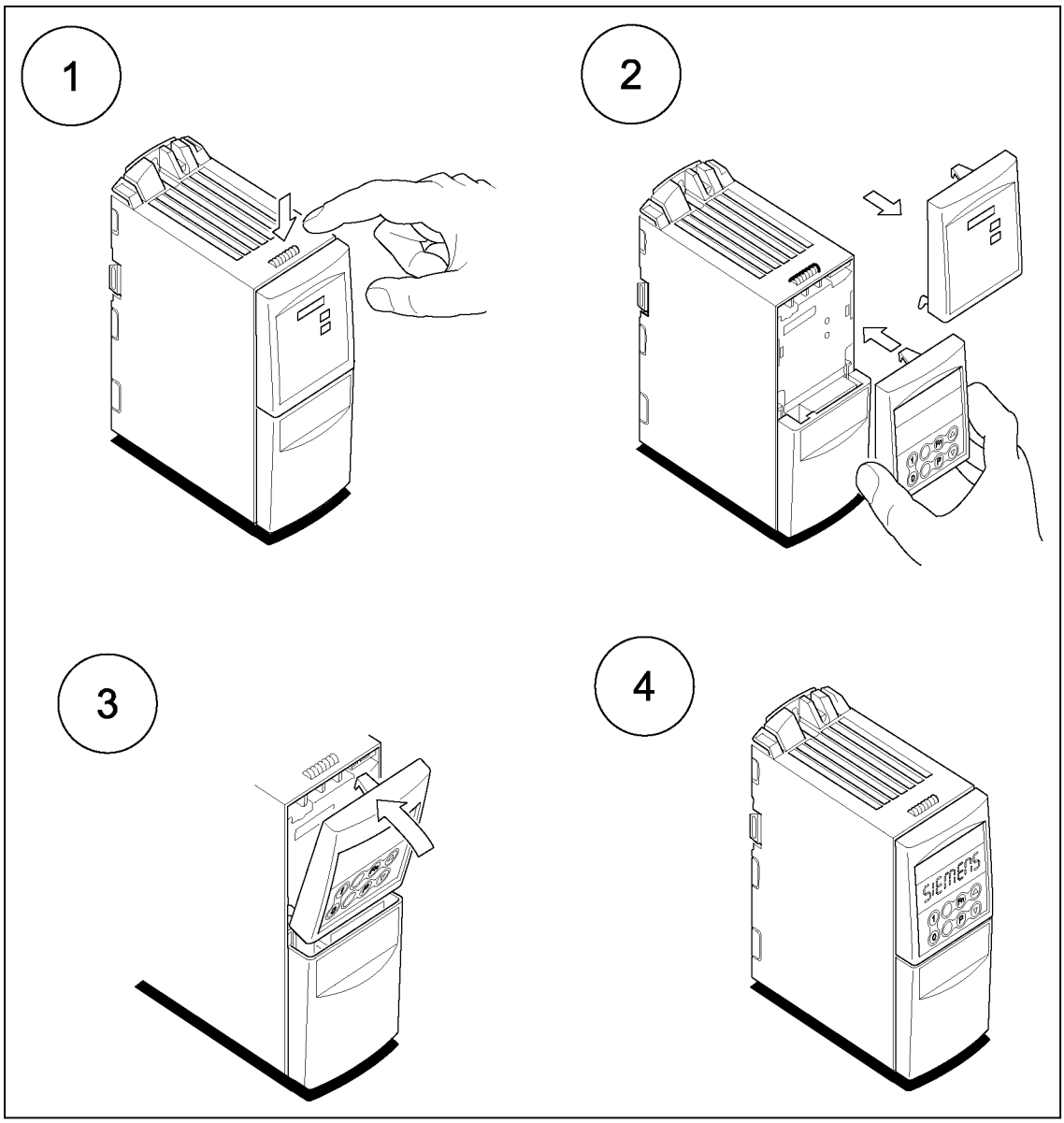
- To achieve these performance levels, you must not exceed the default Pulse frequency nor use cables longer than 25 m.
- The MICROMASTER inverters are intended **exclusively for professional applications**. Therefore, they do not fall within the scope of the harmonics emissions specification EN 61000-3-2.
- Maximum mains supply voltage when filters are fitted is 460 V.

Table 9-5 Compliance Table

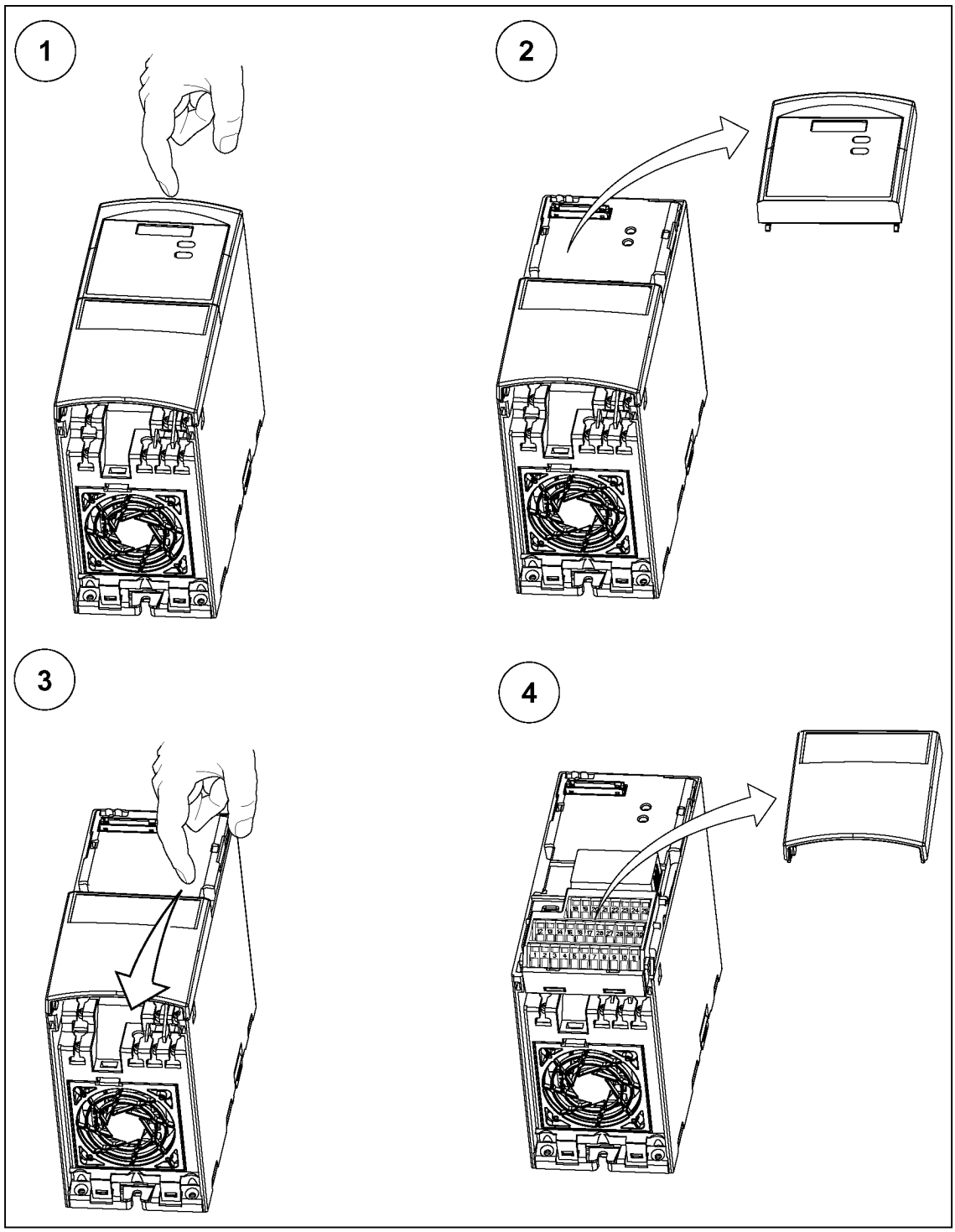
Model	Remarks
Class 1 – General Industrial	
6SE6420-2U***-**A0	Unfiltered units, all voltages and powers.
Class 2 – Filtered Industrial	
6SE6420-2A***-**A0	All units with integral Class A filters
6SE6420-2A***-**A0 with 6SE6400-2FA00-6AD0	Frame size A units 400-480 V with external Class A footprint filters
Class 3 – Filtered for residential, commercial and light industry	
6SE6420-2U***-**A0 with 6SE6400-2FB0*-***0	Unfiltered units fitted with external Class B footprint filters.
* denotes any value is allowed.	

Appendices

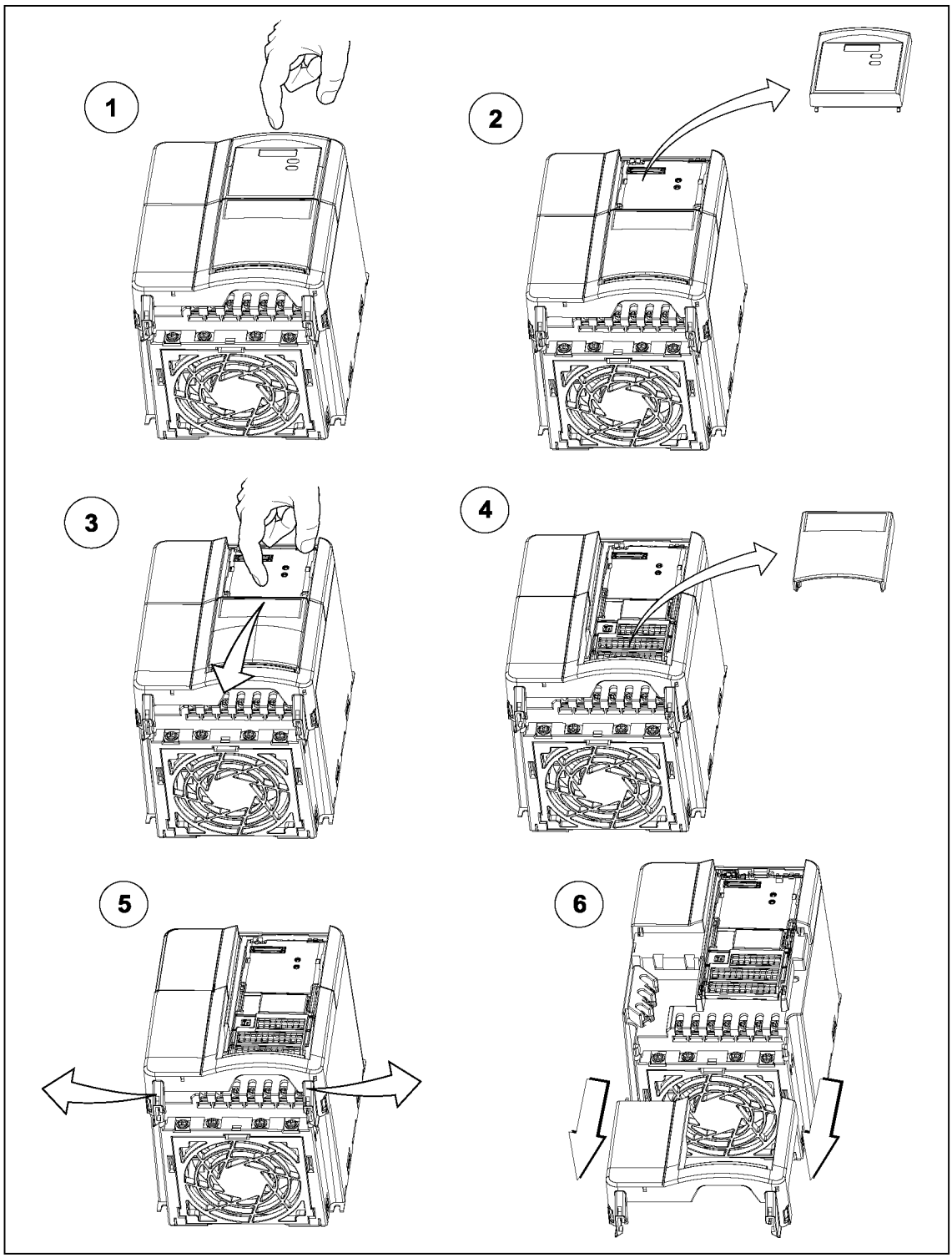
A Changing the Operator Panel



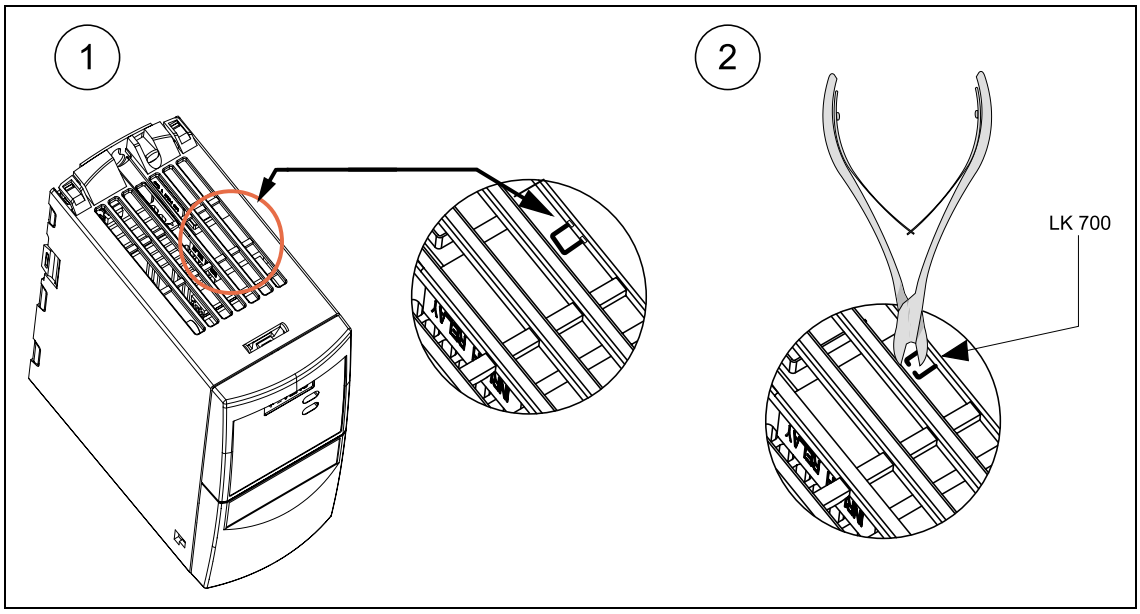
B Removing Covers Frame Size A



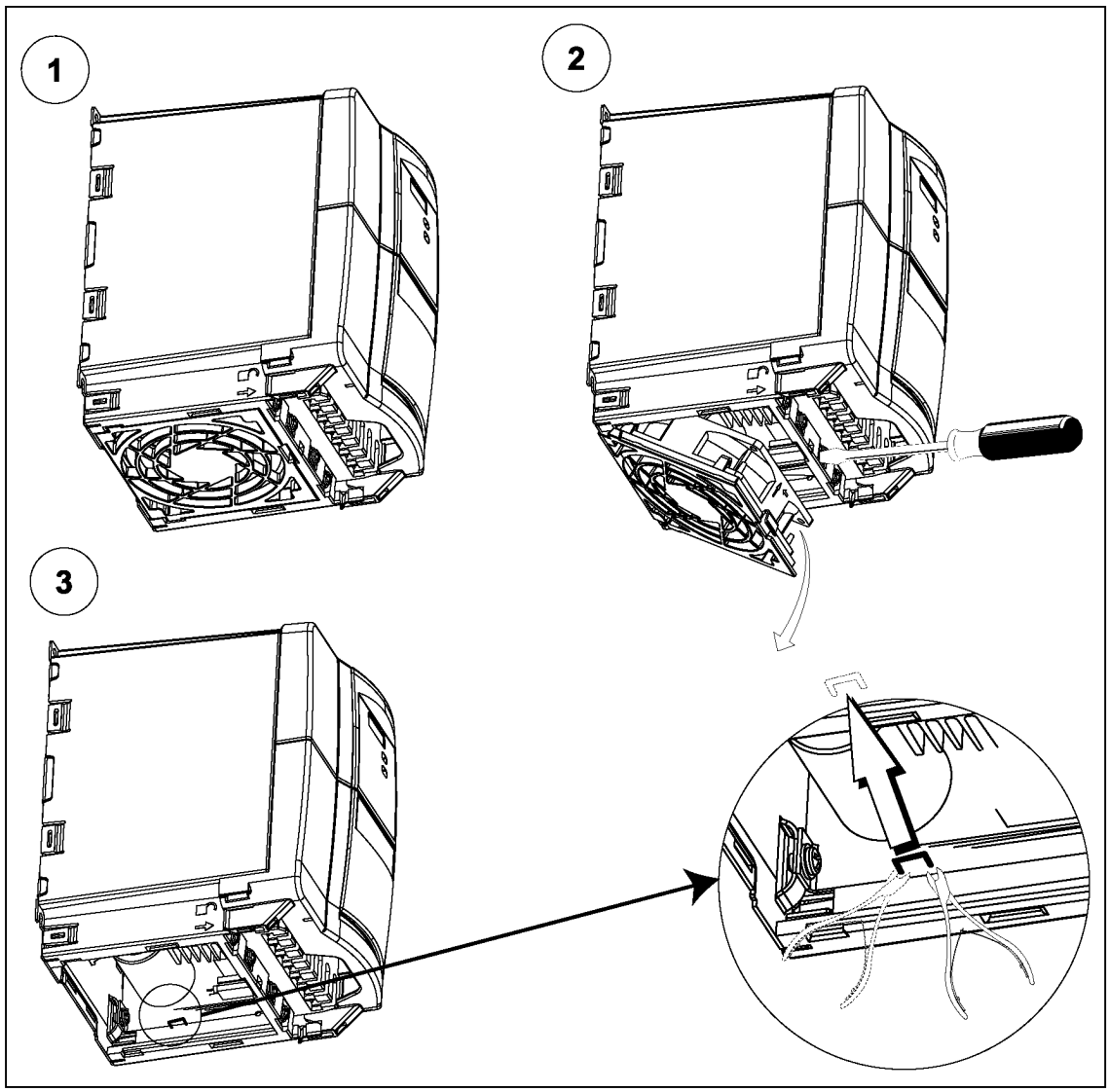
C Removing Covers Frame Size B and C



D Removing 'Y' Cap Frame Size A



E Removing 'Y' Cap Frame Size B and C



F Applicable Standards

European Low Voltage Directive

The MICROMASTER product range complies with the requirements of the Low Voltage Directive 73/23/EEC as amended by Directive 98/68/EEC. The units are certified for compliance with the following standards:

EN 60146-1-1	Semiconductor inverters - General requirements and line commutated inverters
EN 60204-1	Safety of machinery - Electrical equipment of machines

European Machinery Directive

The MICROMASTER inverter series does not fall under the scope of the Machinery Directive. However, the products have been fully evaluated for compliance with the essential Health & Safety requirements of the directive when used in a typical machine application. A Declaration of Incorporation is available on request.

European EMC Directive

When installed according to the recommendations described in this manual, the MICROMASTER fulfils all requirements of the EMC Directive as defined by the EMC Product Standard for Power Drive Systems EN61800-3.

Underwriters Laboratories

UL and CUL LISTED POWER CONVERSION EQUIPMENT 5B33 for use in a pollution degree 2

ISO 9001

Siemens plc operates a quality management system, which complies with the requirements of ISO 9001.

G List of Abbreviations

AC	Alternating Current
AIN	Analog Input
AOP	Advanced Operator Panel
BOP	Basic Operator Panel
CT	Constant Torque
DC	Direct Current
DIN	(Digital Input
DS	Drive State
EEC	European Economic Community
ELCB	Earth Leakage Circuit Breaker
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
FAQ	Frequently Asked Questions
FCC	Flux Current Control
FCL	Fast Current Limitation
I/O	Input and Output
IGBT	Insulated Gate Bipolar Transistor
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PID	Proportional, Integral und Differential
PLC	Programmable Logic Controller
PTC	Positive Temperature Coefficient
QC	Quick Commissioning
RCCB	Residual Current Circuit Breaker
RCD	Residual Current Device
RPM	Revolutions Per Minute
SDP	Status Display Panel
VT	Variable Torque

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Suggestions and/or Corrections

<table>
<tr><td>To:
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MICROMASTER 420

User Documentation

Operating Instructions

Order Number:
6SE6400-5AA00-0BP0

Date of Issue: 12/01

Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.</td></tr>
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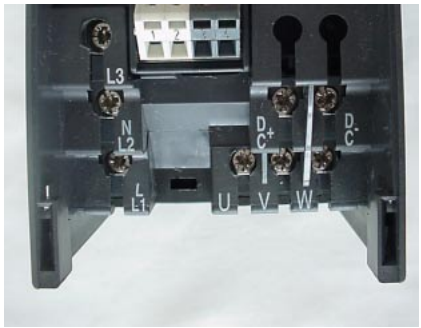
View of Unit	Frame Size A	Frame Size B & C
SDP fitted		
Power Terminal Connections		
Control Terminal Connections		
Access to “Y Cap "		

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